ARMAMENT: Tooling for Bombers at Willow Run — Page 1441

THERE'S A REASON!

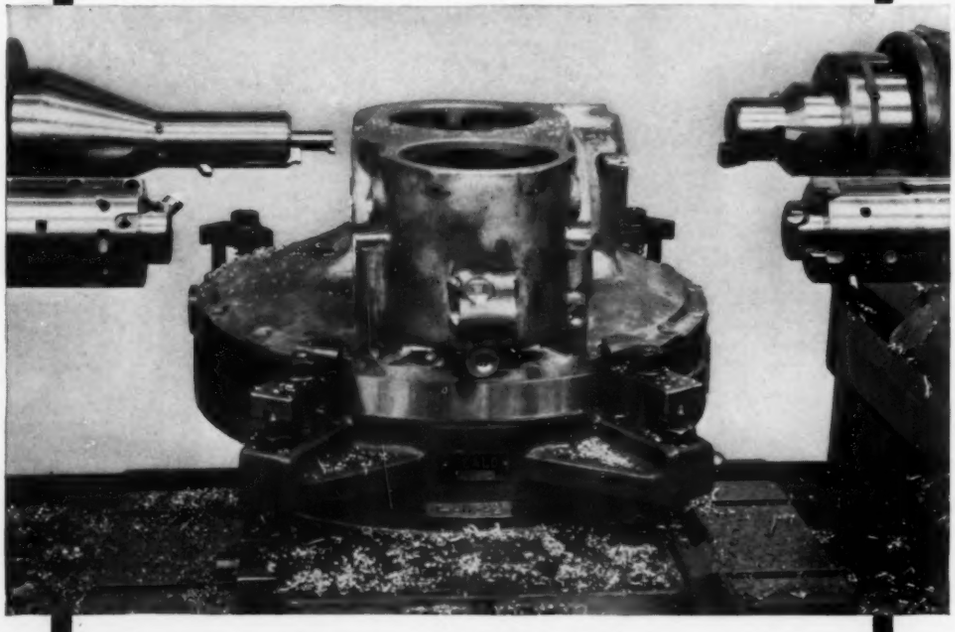
MORE THAN 100 AIRCRAFT PARTS ARE PRECISION FINISHED ON HEALD BORE-MATICS AND GRINDING MACHINES

Cylinders
Cylinder Muffs
Cylinder Healds
Crankcases
Lower Half Crankcases
Crankcase Sections
Crankcase Center Sections
Crankcase Front Sections
Rear Crankcase
Crankcase Covers
Intermediate Crankcase
Wheelcases
Volute Casings
Gear Cases
Reduction Gear Cases
Reduction Drive Supports
Front Covers
Oil Pumps
Bearing Supports
Rear Cam Supports
Master Rods
Articulating Rods
Pistons
Piston Pins
Crankshafts
Crankshaft Rear Sections
Crankshaft Center Assemblies
Crankshaft Dynamic Balancer Weights
Gears
Impeller Shaft Gears
Oil Pump Bodies
Oil Pump Covers
Fuel Pump Bodies
Oil Pump Scavenger Casings
Water Pump Casings
Master Rod Bearings
Crankshaft Bearings
Bushings
Master Rod Spacer Bearings
Valve Inserts
Valve Tappets
Valve Tappet Guides

There's a good reason, too, why leading aircraft manufacturers use Heald Bore-Matics and Heald Internal and Surface Grinding Machines for finishing the more than 100 aircraft parts listed here — that reason, in one word, is *precision.*

Every one of these 100 parts is a highly important aircraft component, every one represents a costly investment in vital craftsmanship and valuable materials, but all of them could be quickly reduced to mere scrap if improper finishing methods were employed. That's why finishing methods and equipment are so important in aircraft production.

The fact that the aircraft industry has chosen Heald Bore-Matics and Grinding Machines for precision finishing such a wide variety of aircraft components speaks for itself. And it's a mighty good reason that you, too, when you specify precision, specify HEALD.



ABOVE — Here a Heald No. 49 Double End Bore-Matic bores, faces and chamfers 21 surfaces in crank case rear covers made of magnesium alloy, all in one work setting.

Valve Spring Lock Washers
Valve Spring Washers
Carburetor Bodies
Spark Plug Parts
Magneto Housings
Magneto Breaker Adapters
Magneto Plate
Magneto Gear Housing
Distributor Gears
Distributor Blocks
Generator Frames
Generator End Shields
Boost Control Housings
Camshaft Brackets
Clutch Selector Housings
Crank Pin Oil Plug
Crankshaft Oil Plug
Fuel Pump Drive Shaft
Fuel Pump Drive Shaft Support
Gear Housings
Knuckle Pin Locking Plate
Push Rod Ball Ends
Regulator Housings
Roller Cams
Valve Housings
Valve Brackets
Valve Bushings
Control Motor End Shields
Selsyn Motor Stators
Hydraulic Operating Cylinders
Gun Synchronizer Bearing Liners
Tail Gear Treadle Assemblies
Propeller Blades
Propeller Blade Bushings
Propeller Shafts
Propeller Hubs
Propeller Shaft Bearings
Propeller Spiders
Propeller Cams
Propeller Hub Cones

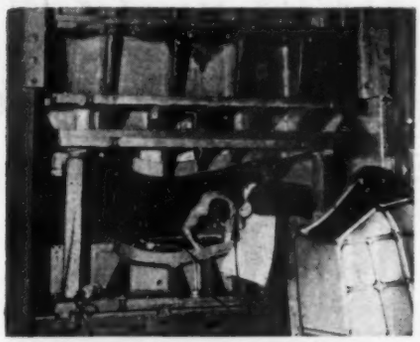
★ ★ ★ ★ ★ ★ ★ ★

THE HEALD MACHINE CO. WORCESTER, MASS., U. S. A.

MANUFACTURERS OF PRECISION BORING AND PRECISION GRINDING MACHINES

AMERICAN MACHINIST

December 10, 1942



Ford's Bombers—Detail tooling at Willow Run sees automotive mass production applied to plane building

MASON BRITTON, Vice-President
FRED H. COLVIN, Editor Emeritus
BURNHAM FINNEY, Editor
KENNETH H. CONDIT, Consulting Editor
JOHN HAYDOCK, Managing Editor
BEN C. BROSHEER — WILLIAM J. HARGEST
Associate Editors
LAURENCE C. MESSICK — E. C. HAINES
PAUL WOOTON, Chief, Washington Bureau — RUPERT LE GRAND, Detroit Editor
BLAINE STUBBLEFIELD — ROBERT COLBORN
Washington Correspondents
N. O. WYNKOOP, Publisher
W. E. KENNEDY, Manager

District Managers: F. S. Weatherby, Boston; J. A. McGraw, New York; B. M. Hilberts, Philadelphia; Ray Deen, Chicago; P. F. Pritchard, Chicago; John Koch, Cleveland; R. H. Anderson, Cincinnati; T. A. Rogers, Detroit.

McGraw-Hill Publishing Company, Inc.

James H. McGraw, Founder and Honorary Chairman; James H. McGraw, Jr., President; Howard Ehrlich, Executive Vice-President; Mason Britton, Vice-President; B. R. Putnam, Treasurer; Joseph A. Gerardi, Secretary; J. E. Blackburn, Jr., Director of Circulation; Editorial and Executive offices, 330 West 42nd Street, New York. N. Y. Publication office, 99-129 North Broadway, Albany, N. Y. Branch offices: Chicago, 520 North Michigan Ave.; San Francisco, 68 Post Street; Los Angeles, 601 W. Fifth Street; Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta.

VOLUME 86 — NUMBER 25

AMERICAN MACHINIST. Copyright 1942 by McGraw-Hill Publishing Co., Inc. Published every other Thursday, price 35c. a copy. Allow ten days for change of address. Address all communications about subscriptions to the Director of Circulation, American Machinist, 330 West 42 Street, New York, N. Y. Subscription rates — United States, Canada, Mexico and Central and South American countries, $5.00 a year, $8.00 for two years, $10.00 for three years. All other countries $8.00 a year, $13.00 for two years, $16.00 for three years. Entered as second class matter, September 29, 1936, at Post Office, Albany, N. Y., under the act of March 3, 1879. Printed in U.S.A. Cable address "McGrawhill, New York." Member of A.B.P. Member of A.B.C.

A McGRAW-HILL PUBLICATION

PRINTED IN U. S. A.

MAJOR ARTICLES

Ready for a Raid ..... *P. E. Rousseau* 1419
Short Cuts for the Small Shop ..... *A. H. Waychoff* 1423
Round-the-Clock Inspection ..... *John Haydock* 1424
Assembly by Silver Brazing ..... *Herbert Chase* 1426
Fixture Sharpens Thread Hobs ..... *Roland Gerhart* 1429
Refined Quality Control ..... *John Gaillard* 1430
Electronics—Secret Weapon of War ..... Facing Page 1432
War-Winning Suggestions 1433
Maintenance of Press Tools ..... *H. R. Hageman* 1436

ARMAMENT SECTION

Tooling for Bombers at Willow Run 1441

SHORT ARTICLES

What's Wrong With Production? ..... *Fred H. Colvin* 1484
Chrome Plating Saves Tool Steel 87

IDEAS FROM PRACTICAL MEN

Center Marker and Grinding Jig ..... *August Kuehn* 1438
Cutting Belts for Lacing ..... *John E. Hyler* 1438
Dressing Mica on Commutators ..... *A. Vern Kilpatrick* 1439
Clamp for Lifting Machines 1439
Leveler Holds Turbine Blade for Milling ..... *Ben Litzman* 1439
Compound Toolholder ..... *George Holman* 1440
Stopping Chatter on Long Work ..... *Ralph R. Waech* 1440

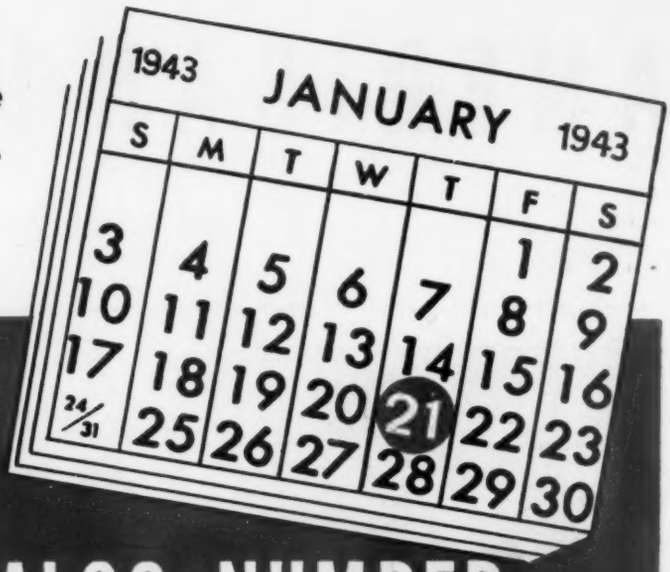
NEWS OF THE INDUSTRY

Gaging Business 1460b
Inside Detroit 1460g
War Orders in Brief 1460h
Wartime Washington 1460i
Names in the News 1460o
Obituaries 1460p

DEPARTMENTS

What's in This Issue 85
Reference Book Sheet 1457
Editorial 1460a
Shop Equipment News 1461
New Materials 1478
Trade Publications 1479
New Books 1482
Seen and Heard 1483

MARK January 21, 1943, as the date to expect your copy of . . .



THE 30TH ANNUAL REVIEW and CATALOG NUMBER

—a summary of new materials, equipment and parts

—a 1943 Metal-Working reference

Summary of New Equipment, Materials and Parts—introduced to Metal-Working and described in *American Machinist* within the past year. Descriptions of more than 1,000 items, with illustrations, for executives responsible for top-speed and maximum-efficiency war production.

Classified for Ready Reference—1. Machine Tools, 2. Tools and Accessories, 3. Forming Equipment, 4. Heat-Treating, Welding, Cleaning and Finishing, 5. Plant Service Equipment, 6. Parts and Materials.

Enlarged Where-To-Buy Directory—more than 6,000 up-to-date listings of companies making products used by Metal-Working.

Directory of Contract-Work Facilities—including Advertising of firms equipped to do contract work throughout the country. Particularly valuable in these days of extensive sub-contracting.

★ **A major part of this one-volume reference library will be its many Advertising pages giving specific information on products you buy and use. Look to the 30th Annual for detailed data on wartime and post-war sources of supply.**

AMERICAN MACHINIST

HEAVY-DUTY SERVICE . . . is the keynote of our Navy's action, and back of the ships must be machines designed for equally arduous work. That is why the **No. 24 GENERATOR** is found on Navy projects throughout the country. A completely universal machine for cutting a wide variety of straight bevel gears, it combines the qualities of versatility, high production, and wide capacity. In production, maintenance, and repair work for the Navy the No. 24 is proving how the long-established Gleason standards of quality measure up to the demands of today's war effort.

GLEASON WORKS

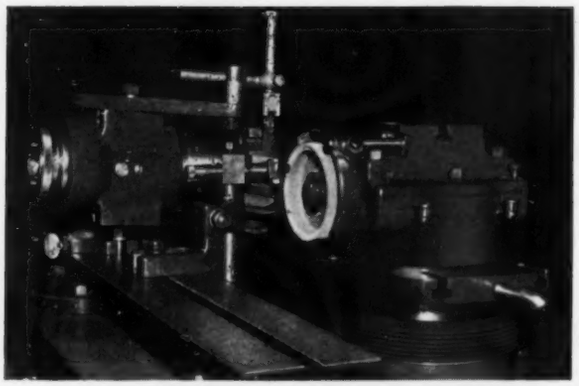
Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

A PRACTICAL GUIDE

greater production

EXCERPTS FROM THE PAGES OF THIS INTERESTING BOOKLET



GRINDING THE FACE OF MILLING-CUTTER TEETH

GENERAL INSTRUCTIONS FOR SHARPENING MILLING CUTTERS

A poorly sharpened cutter increases the cost of milling in several ways. First, the cost of sharpening is increased, because the cutter must be sent to the tool maintenance man for regrinding more often than would otherwise be necessary. And secondly, the life of the cutter is shorter, since the useful life is directly proportional to the number of grinds necessary to keep the cutter sharp and in good condition. Thirdly, time is wasted in replacing a dull cutter with a sharp one. Lastly, there will probably be a greater proportion of inferior milled surfaces rejected by the inspection department.

General purpose cutters should be ground for the kind of material on which the cutter is to be used, adhering to established standard clearance angles for different types of cutters such as face mills, spiral mills, end mills, thread milling cutters, etc. Relatively small diameter cutters can be given a smaller clearance angle, as the feed is usually reduced in proportion to the size of the cutter.

PRACTICAL CUTTER GRINDER SET-UPS

LONG END MILLS

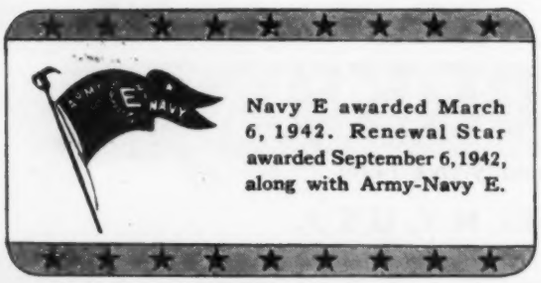
End mills which are too long to grind the face of the teeth in the conventional manner, may be ground on the CINCINNATI No. 2 Cutter Grinder with the set-up illustrated. Up to 8" flute length may be accommodated in this manner. However, the range of cutter diameter is limited, because the overhanging table limits the traverse movement of the slide.

ANGULAR CUTTERS

Like any other type of cutter, straight tooth angular cutters may be sharpened by either the disc wheel or cup wheel methods. When using the cup wheel method, the clearance angles are obtained by rotating the cutter a given angle, bringing the cutting edge to be ground below the center of the wheel. Because of the taper of the cutter, the large end travels a greater distance away from the wheel when the cutter is rotated through the clearance angle. With the tooth rest mounted on the table or headstock, this method produces a variation in width of land. On the other hand, with the tooth rest mounted on the wheel head, the clearance angle will vary. Therefore, this method of grinding straight tooth angular cutters should be avoided. The best practice is to use a disc wheel, because the clearance is then created by the curvature of the wheel, and mount the tooth rest on the wheel head.

CUTTER LIFE INCREASED by ROUNDING CORNERS

In sharpening face and end mills the usual procedure is to grind a 45 degree corner on the teeth. Sometimes an attempt is made to obtain an approximate radius by three grindings: 22½ degrees, 45 degrees, and 67½ degrees. Even then the corners are still present, and although they are not so pronounced, they are the starting points for premature wear.



Navy E awarded March 6, 1942. Renewal Star awarded September 6, 1942, along with Army-Navy E.

THE CINCINNATI

TOOL ROOM AND MANUFACTURING

TO...

per cutter

GRINDING OF CEMENTED-CARBIDE MILLING CUTTERS

As a result of the relative brittleness of cemented carbides, producing a sharp cutting edge on these materials, is also much more difficult than on steel. Grinding must, therefore, be done by removing a little material at each pass without trying to take the metal off too fast. Pressure between the tool and the grinding wheel must be light, and a constant motion in the direction of the feed must be maintained, to prevent localized heating of the cemented-carbide tip.

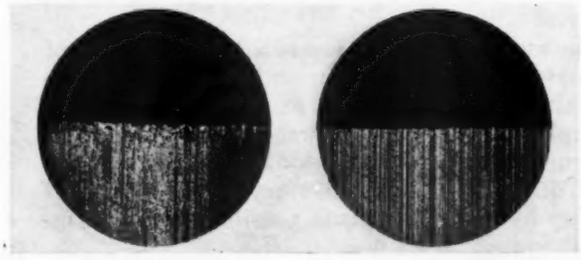


Fig. 1. Cutting Edge Finish Ground With a Fine Abrasive Wheel (100X).

Fig. 2. Cutting Edge Finish Ground With a Fine-Grit Diamond-Wheel (100X).

The booklet illustrated, "Discussion of Everyday Problems in Cutter Sharpening," another official communique from Milling Headquarters, is yours for the asking.

AN ACTUAL CASE

	CORRECTLY Sharpened Cutter	INCORRECTLY Sharpened Cutter
Cost of Cutter	$36.80	$36.80
Maximum Wear	1" on dia.	1" on dia.
Stock Removal per Grind	.004"	.008"
Possible Number of Grinds	$\frac{1.000}{.004} = 250$	$\frac{1.000}{.008} = 125$
Pieces per Grind	15	4
Pieces per Cutter	$15 \times 250 = 3750$	$4 \times 125 = 500$
Cutter Cost per Piece	$\frac{\$36.80}{3750} = \$.0098$	$\frac{\$36.80}{500} = \$.073$

LIFE OF CUTTER RATIO — 7½ to 1

CINCINNATI

MILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

MILLING MACHINES • SURFACE BROACHING MACHINES • CUTTER SHARPENING MACHINES

Helen o

This was in truth the face that launched a thousand American ships. She was so beautiful, she [illegible] uncomfortable!

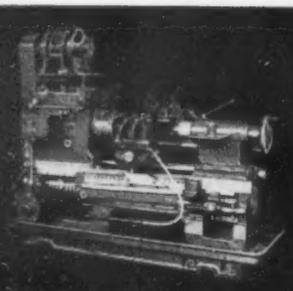
Not alone from the bustles and the corsets and the voluminous billows of tent cloth. Daily her life was besieged with the drudgery and the discomforts of the Gilded Age: The flat iron, the wood stove, the wash tub and the carpet beater, gaslight and the coal grate, horsecars and hansom cabs. But all these things have changed . . . miraculously and wonderfully changed.

And that is the theme of this story: *Change!*

Now or today the world is changing faster than ever before, and the first 5 years after this war will be equal to any 25 years of the past. Because this is true, we at Jones & Lamson have an important story to tell.

We were already 50 years old when Helen of Troy was a girl. We began with the birth of the Machine Age in America, and even in the very birthplace. Many of the precision machine tools designed and developed by Jones & Lamson engineers during more than a century of the company's history have literally made possible much of America's industrial change.

Change is the very reason for Jones & Lamson's existence — and for its importance to American industry today.



FAY AUTOMATIC LATHES

AUTOMATIC THREAD GRINDERS

OPTICAL COMPARATORS

AUTOMATIC OPENING DIE HEADS

# of Troy, U.S.A.

DURING a single year of this war, with its problems of changing production, American manufacturers —from the largest to the smallest— have called upon Jones & Lamson many thousands of times for counsel, service or precision machine tools.

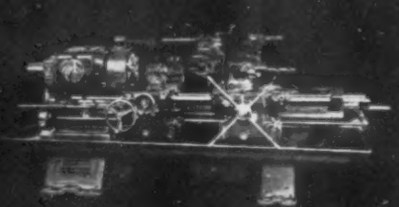
If your business is manufacturing with metal — if you have problems today — and if you are looking ahead to the swiftly changing markets, products and methods of manufacturing after the war — Jones & Lamson engineers and service men can help you. Call upon them!

JONES & LAMSON
MACHINE COMPANY

Manufacturers of . Universal Turret Lathes . Fay Automatic Lathes
Automatic Thread Grinders . Optical Comparators . Automatic Opening Die Heads

Springfield, *Vermont,* U. S. A.

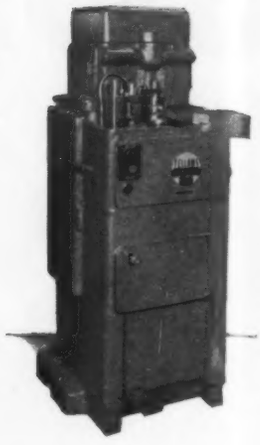
PROFIT-PRODUCING
MACHINE TOOLS

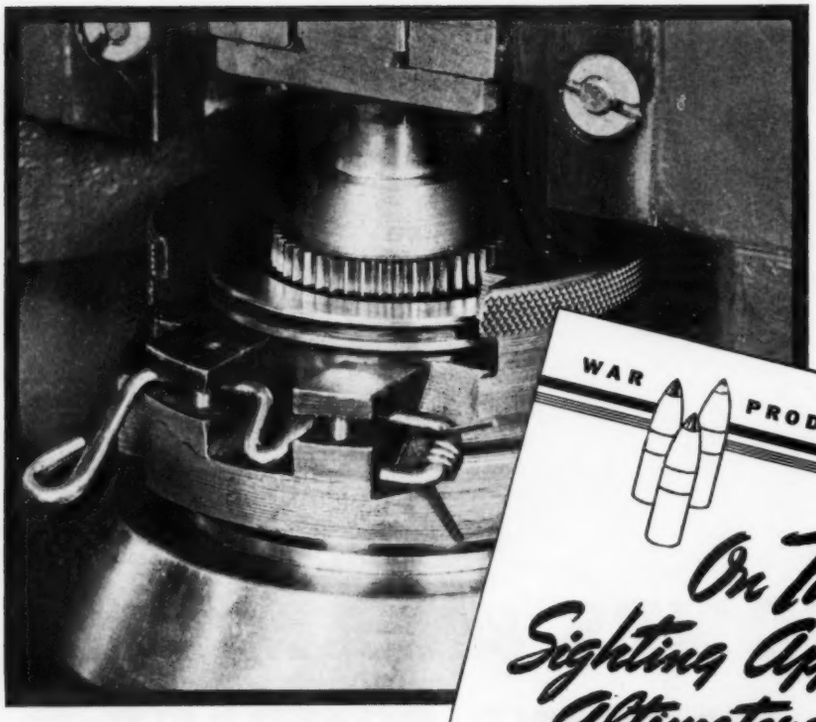


SADDLE TYPE
UNIVERSAL TURRET LATHES

RAM TYPE
UNIVERSAL TURRET LATHES

THIS Small





Cutting the internal gear for a bomb-fuse on the 3-inch Fine-Pitch Gear Shaper.

WAR PRODUCTION BULLETIN

On Time Fuses, Sighting Apparatus, Altimeters etc., etc.

THE FELLOWS 3-INCH FINE-PITCH GEAR SHAPER IS BREAKING ALL PRODUCTION RECORDS ON GEAR TYPE PARTS

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTION

GEAR SHAPER

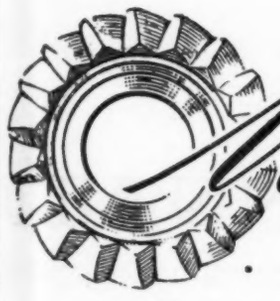
ARRIVED JUST IN TIME . . .

Figuratively, and actually, Fellows announced this new machine just in time to have it available for the multiude of small, fine-pitch gears and kindred parts which were rushed into war production.

This machine has taken over the job; it holds the work to precision tolerances, and has set a production pace beyond all precedent.

It employs cutter-spindle speeds up to 2000 strokes per minute and can be equipped with quick-acting loading fixtures for holding the work. Inherent Fellows precision, ease of cutter duplication, and the Service that goes with the machine are other advantages that appeal to experienced production men.

Fellows will be glad to place its Small Gear Shaper Circulars in the hands of all who are interested. Write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit, or 640 West Town Office Building, Chicago.



Method

. . . . FROM BLANK TO FINISHED GEAR

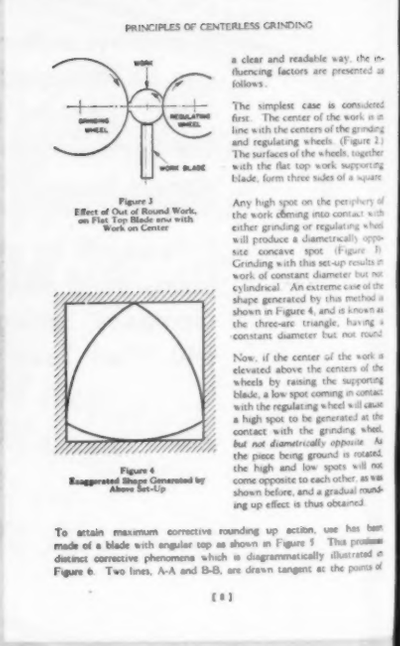
This will help

YOUR GRINDER SE

SOME machines can be operated quite successfully with no knowledge whatever of how they work or their basic principles of construction. Business machines, household equipment, and radios necessarily fall within this classification. So, too, can CINCINNATI Centerless Grinders be operated with a minimum knowledge of the principles upon which they operate. Nevertheless, this type of information is highly important to set-up men and supervisors if they are to obtain continuous operation of the machines at a high rate of production.

The booklet illustrated at the right, "Principles of Centerless Grinding," is another official communique from Grinding Headquarters, and explains principles and methods, briefly discusses wheels and blades, and contains tables of thru-feed traverse rates. It is offered free to those working with centerless grinders or interested in the centerless method of precision cylindrical grinding.

A FEW PAGES FROM THIS BOOKLET



PRINCIPLES OF CENTERLESS GRINDING

Figure 3
Effect of Out of Round Work, on Flat Top Blade arise with Work on Center

Figure 4
Exaggerated Shape Generated by Above Set-Up

a clear and readable way, the influencing factors are presented as follows.

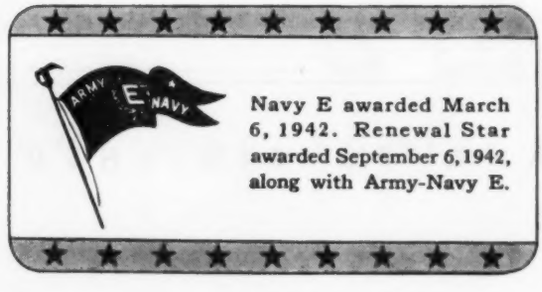
The simplest case is considered first. The center of the work is in line with the centers of the grinding and regulating wheels. (Figure 2.) The surfaces of the wheels, together with the flat top work supporting blade, form three sides of a square.

Any high spot on the periphery of the work coming into contact with either grinding or regulating wheel will produce a diametrically opposite concave spot (Figure 3). Grinding with this set-up results in work of constant diameter but not cylindrical. An extreme case of the shape generated by this method is shown in Figure 4, and is known as the three-arc triangle, having a constant diameter but not round.

Now, if the center of the work is elevated above the centers of the wheels by raising the supporting blade, a low spot coming in contact with the regulating wheel will cause a high spot to be generated at the contact with the grinding wheel, *but not diametrically opposite*. As the piece being ground is rotated, the high and low spots will not come opposite to each other, as was shown before, and a gradual rounding up effect is thus obtained.

To attain maximum corrective rounding up action, one has been made of a blade with angular top as shown in Figure 5. This produces distinct corrective phenomena which is diagrammatically illustrated in Figure 6. Two lines, A-A and B-B, are drawn tangent at the points of

[8]



Navy E awarded March 6, 1942. Renewal Star awarded September 6, 1942, along with Army-Navy E.

CINCINNATI G

CENTER TYPE GRINDING MACHINES

CINCINNATI

R SET-UP MEN

BASIC PRINCIPLES

contact of the work with the wheels, and another line, C-C, shows the plane of the angular top of the blade. If a low spot on the work comes in contact with either the blade or the regulating wheel, as in the case of the part shown in dotted lines, the approximate center of the work will be lowered. With centers of both wheels being fixed, the smallest diameter can be generated on their center line. The lowering of the center of the work towards the center line of the wheels causes the reduction in the diameter of the ground piece. Conversely, any increase in height of the center of the work above the center line of the wheels causes generation of a correspondingly larger diameter. Thus the grinding wheel, instead of leaving a high spot on the periphery of the work equal to the depth of the concave spot at the contact with the regulating wheel, generates a proportionally smaller high spot at its contact with the work. In this manner, low and high spots "dampen" themselves out theoretically approaching cylindrical shape in infinity, but in actual practice cylindrical form is obtained in a short time.

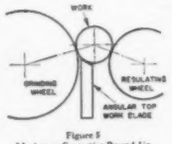


Figure 5
Maximum Corrective Round-Up Action Obtained with this Basic Set-Up

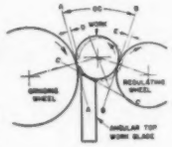


Figure 6
Diagrammatic Sketch of Corrective Action

For the above reason, fastest rounding up action is obtained with high regular velocity of the work, which is controlled at will by increasing the speed of the regulating wheel.

[9]

	Diamond			
	Rough Grinding	Finish Grinding	Rough Grinding	Finish Grinding
Grinding Wheel	10 to 20	4 to 7	40 to 60	10 to 20
Regulating Wheel	1 to 2	1 to 2	not used	not used

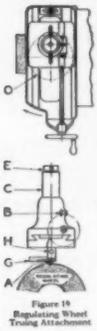


Figure 19
Regulating Wheel Truing Attachment

Regulating Wheel Truing Equipment. A brief description of the regulating wheel truing attachment, Figure 19 is given here, because it is peculiar to the centerless machine. Diamond "A", from one to two carats in size, is mounted in a $\frac{5}{16}$" diameter nib 1" long. This nib is fastened in diamond holder "G", which is secured to adjustable sleeve "C" by means of screw "H". The sleeve, which can be moved vertically through its housing, is clamped in position by means of screw "B". Dial "E" is for accurate adjustment of the diamond towards the wheel. Maximum adjustment which can be obtained by turning the graduated dial is $\frac{1}{2}$", each space being equivalent to .001". Either a perfect cylinder or a wheel with concave face is generated by this truing device.

The standard regulating wheel truing attachment trues the wheel only for straight cylindrical work. If other shapes must be ground, a similar attachment known as the Profile Truing Device, may be obtained to true the wheel to the shape of the work. When the machine is so equipped, and with a straight cam on the truing device, the following tapers can be trued on the wheel:

6° face wheel, 8° taper
7° face wheel, 7° taper
8° face wheel, 6° taper

Generally speaking, the function of the standard regulating wheel truing device is to make the diamond follow the same line of contact with the wheel as that followed by the work. In other words, the regulating wheel must be trued so that the work, while passing between the wheels, makes contact with the entire width of the wheel face. To obtain this condition, three factors must be taken into consideration.

[24]

WHEELS

ding wheel.
is swiveled.
work with respect to the center of the
nature of the work.

The second factor is fixed by the first, that is, the truing fixture must be rotated about its trunion "O" an angle equal to the angle of inclination of the regulating wheel spindle. For example, suppose that the rear end of the spindle is depressed 5° below the horizontal. Then the truing fixture must be swiveled 5° in a clockwise direction (considering the plan view, Figure 19).

The third factor is fixed by the diameter of the work. Suppose that the correct line of contact between the work and the wheel is $\frac{1}{4}$" above the center of the wheels. Then diamond holder "G" must be moved approximately $\frac{1}{4}$" in the direction indicated by the arrow. (To the right when viewed from the wheel end of the spindle). Conversely, if the center-line of the work is **below** the center of the wheels, the diamond must be moved to the left by the same amount.

More precise results may be obtained by calculating the theoretically correct set-over of the regulating wheel truing diamond. Use the following formula. (See Figure 20.)

$$\text{Set-over} = \frac{DH}{D + d}$$

D = Diameter of regulating wheel
d = Work diameter
H = Height of work center above center of wheels.

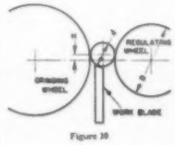


Figure 20

Note.—Use the highest regulating wheel speed available when truing.

Multiple diameter work can be ground by the infeed method if the differences in diameter are not too great. To true the wheel, mark the slide to indicate the length of each ground diameter, and adjust the dial to displace the diamond an amount equal to the radial difference between the ground surfaces.

[25]

TI GRINDERS INCORPORATED

CINCINNATI, OHIO, U. S. A.

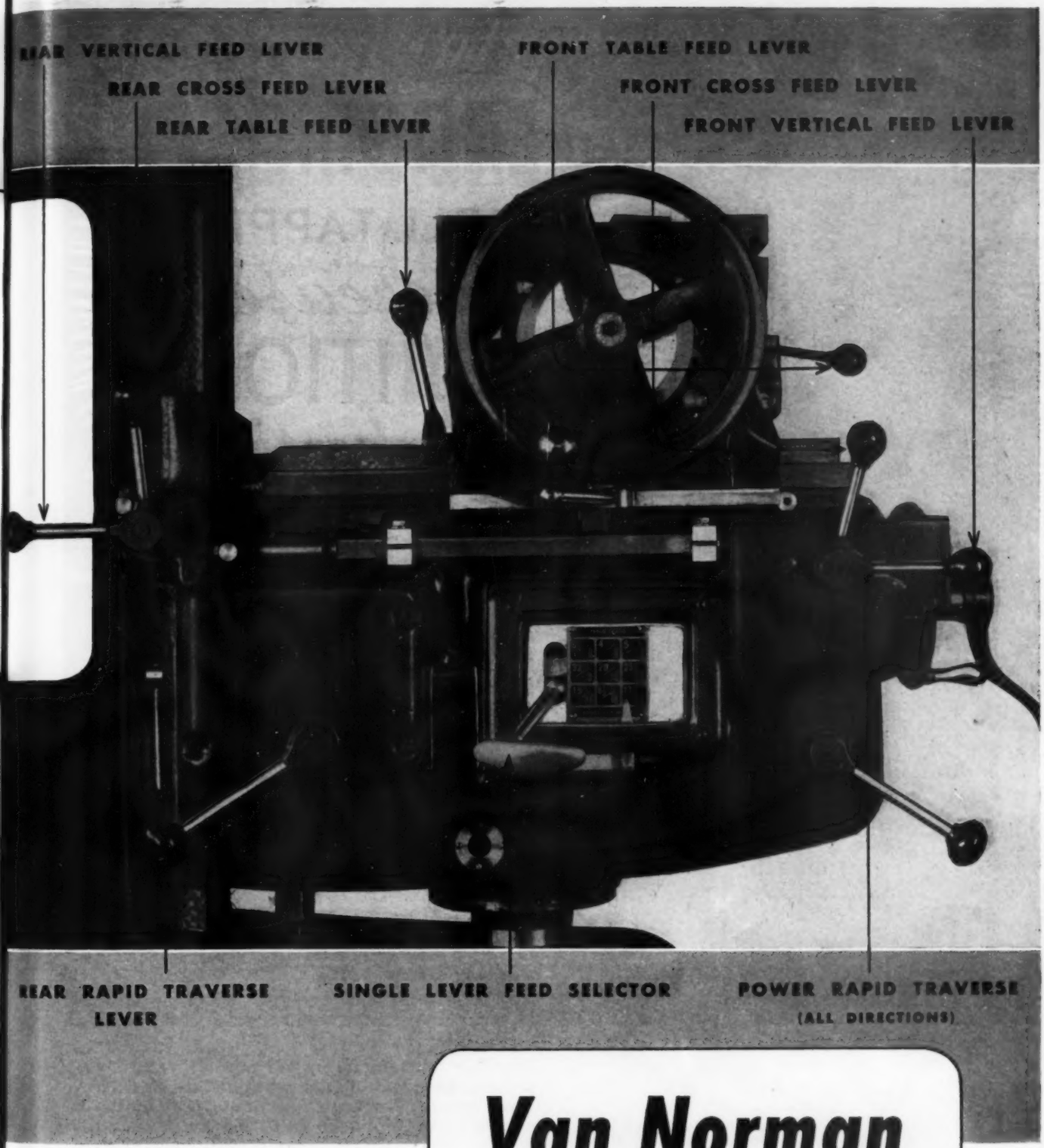
NES CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

VAN NORMAN CONTROLS ARE *Easy to Reach and Use*

...SAVE TIME AND LESSEN FATIGUE

An operator working at the front or back of a Van Norman Milling Machine can readily reach a full set of power controls without going around to the other side of the machine. These controls are conveniently grouped and easy to use. They are *directional* in motion and remove any chance of confusion, because the levers are moved in the same direction in which the operator wishes to move the table, knee and saddle,—left or right, up or down. An illustrated bulletin describes these and many other advantages of Van Norman Milling Machines. Write for a copy today, on your business letterhead.

VAN NORMAN MACHINE TOOL COMPANY


REAR VERTICAL FEED LEVER
REAR CROSS FEED LEVER
REAR TABLE FEED LEVER
FRONT TABLE FEED LEVER
FRONT CROSS FEED LEVER
FRONT VERTICAL FEED LEVER
REAR RAPID TRAVERSE LEVER
SINGLE LEVER FEED SELECTOR
POWER RAPID TRAVERSE (ALL DIRECTIONS)

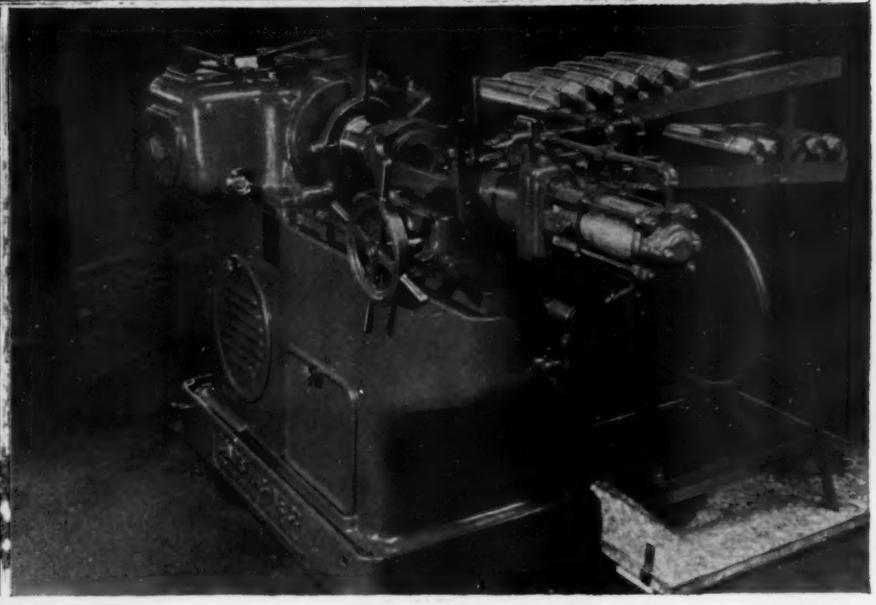
Van Norman

MILLING MACHINES

In June, 1942, Van Norman was awarded the Army and Navy E in recognition of its war production record

SPRINGFIELD, MASS.

LANDMACO
SHELL TAPPERS
Increase
MUNITIONS
Production



Munitions manufacturers get greater accuracy *plus* increased production with the LANDMACO Shell Tapper. Precisely built and especially designed for tapping shell noses, one machine and one universal fixture handles all sizes from 75 m/m to 155 m/m. You eliminate any possibility of a bottleneck in your munitions production by using The 1½ R LANDMACO Shell Tapper.

Write for booklet

LANDIS MACHINE COMPANY
WAYNESBORO, PENNA., U. S. A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

Speed Up . . .
YOUR MUNITIONS PRODUCTION

Standardize on the 1½ R LANDMACO Shell Tapper and LANDIS Collapsible Taps and obtain greater accuracy and higher production with fewer labor hours and at less cost.

Write for Bulletin
"Be Threadwise
LANDIS*ize*"

LANDIS MACHINE COMPANY
WAYNESBORO, PENNA., U. S. A.

LANDIS
REG. U.S. TRADE — MARK PAT. OFF.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

"AMERICAN"

FOR ALL-OUT PRODUCTION

Records Made and Broken Everyday!

"AMERICAN" Hole Wizard Radials are really "goin' to town" on aircraft crank cases. We have reports almost every day from leading airplane engine plants of new records being made and then broken by these "Newest New Radials."

Drilling, reaming, spot facing, boring, tapping—in fact, every kind of work that a Radial Drill will do is handled quickly, easily and at record speed on the "AMERICAN" Hole Wizard.

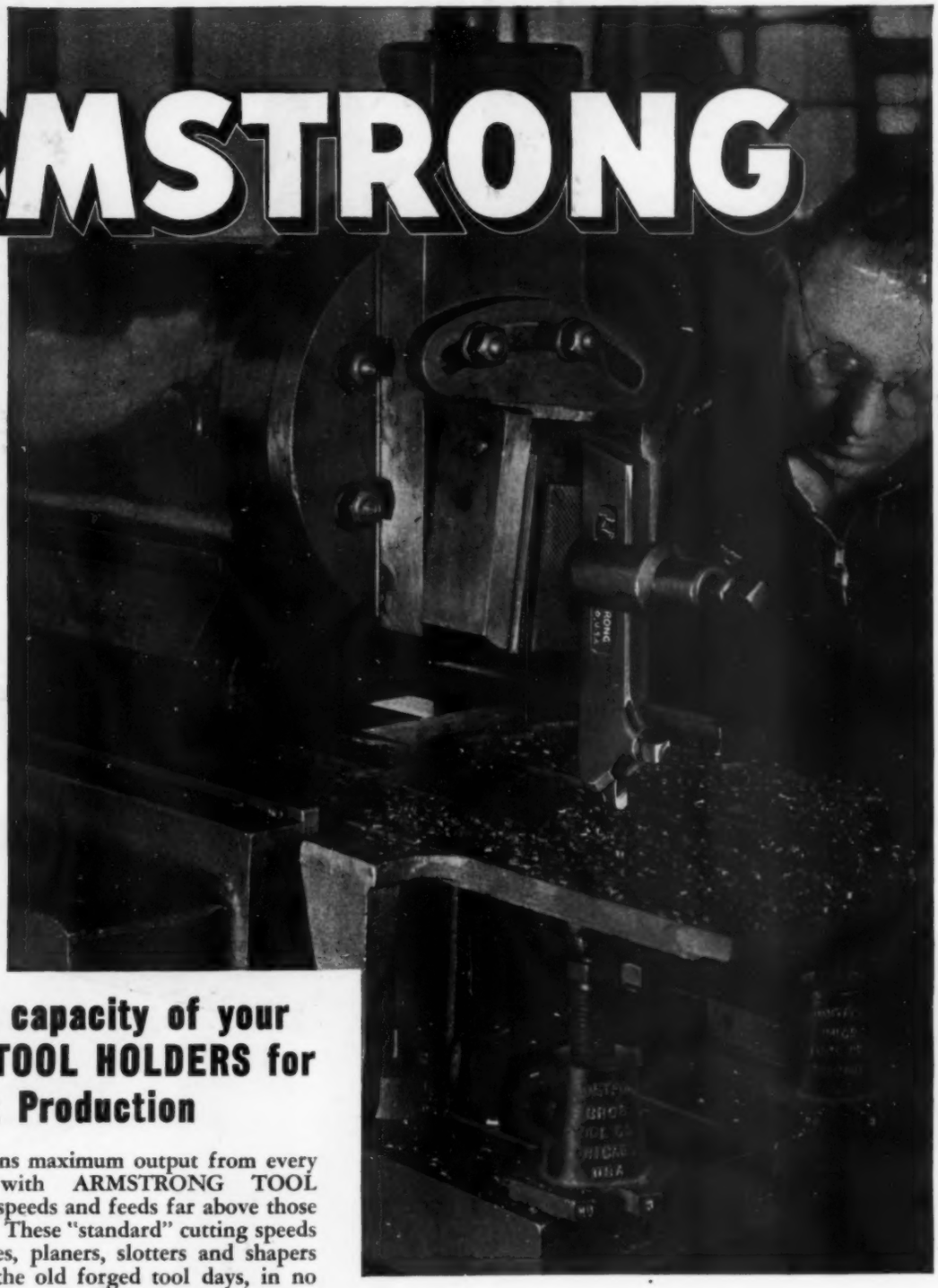
New Bulletin No. 328 tells the story.

THE AMERICAN TOOL WORKS CO.
CINCINNATI, OHIO, U. S. A.

"AMERICAN" *Hole Wizard* RADIALS

LATHES RADIALS SHAPERS

ARMSTRONG



Use the full capacity of your ARMSTRONG TOOL HOLDERS for All-Out Production

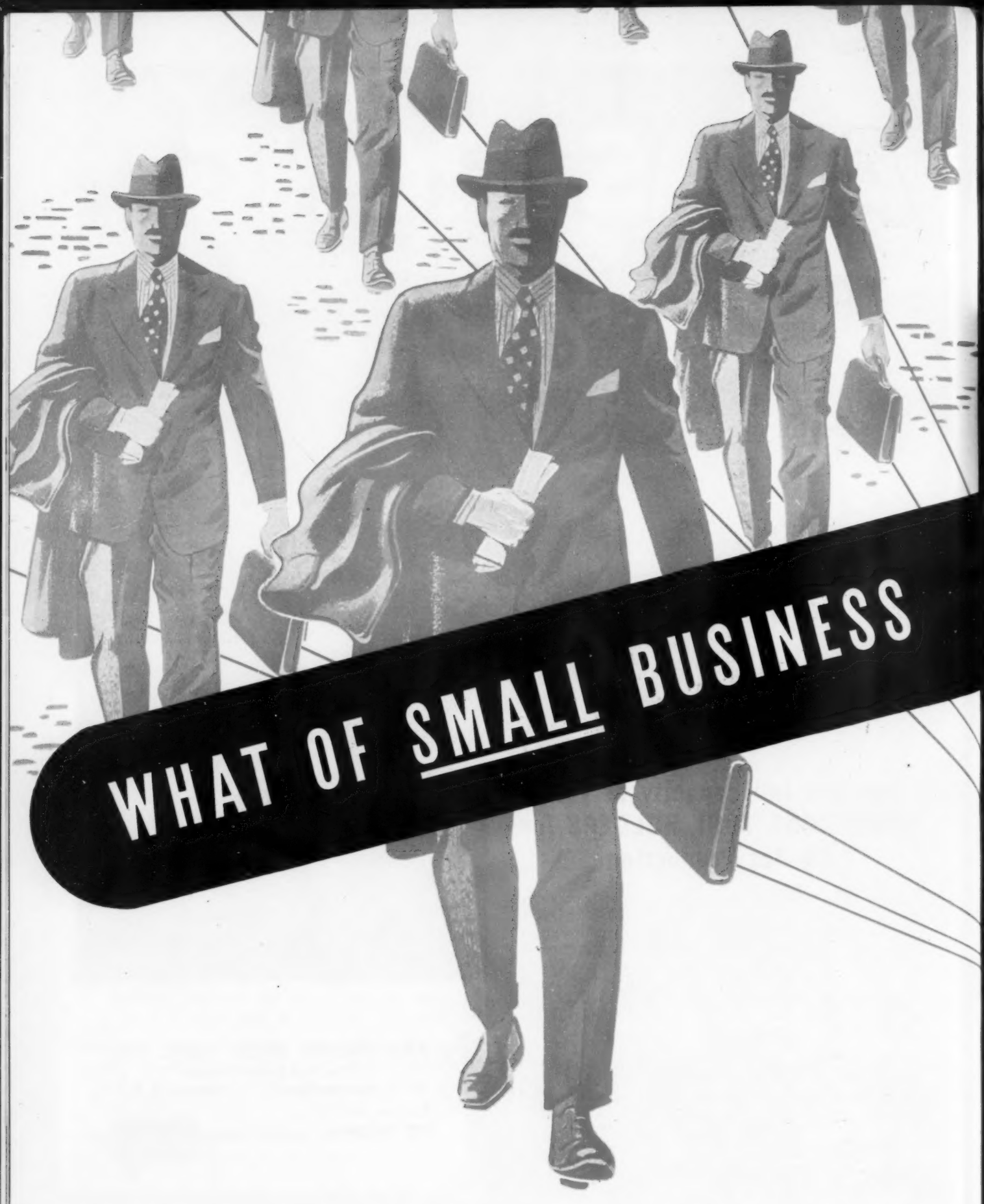
All-out production means maximum output from every machine tool and with ARMSTRONG TOOL HOLDERS that means speeds and feeds far above those accepted as "standard". These "standard" cutting speeds generally used on lathes, planers, slotters and shapers are a carry over from the old forged tool days, in no sense represent the capacity of a modern machine tools equipped with the correct ARMSTRONG TOOL HOLDER for each operation.

To produce more, equip every lathe, planer, slotter and shaper with modern ARMSTRONG TOOL HOLDERS and step-up speeds and feeds. Higher speeds are frequently smoother cutting; and, your ARMSTRONG TOOL HOLDERS will stand up to any output machine tools can attain.

Equip with ARMSTRONG TOOL HOLDERS and speed war production—Let's produce *"enough on time."*

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave. Chicago, U. S. A.
Eastern Warehouse & Sales:
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms



SEND FOR THE MAN FROM BRYANT

AFTER THIS WAR?

SOME amazing things are happening behind the scenes of American industry — developments that are already shaping our post-war economic destiny and that point to an amazing possibility:

Contrary to general pessimistic belief, peace may bring undreamed-of prosperity!

Today, full war production is breaking down monopoly control, opening untapped resources, creating new and cheaper materials, sweeping aside old restrictions and long established restraints of trade. And the result of this vast internal reorganization is opportunity!

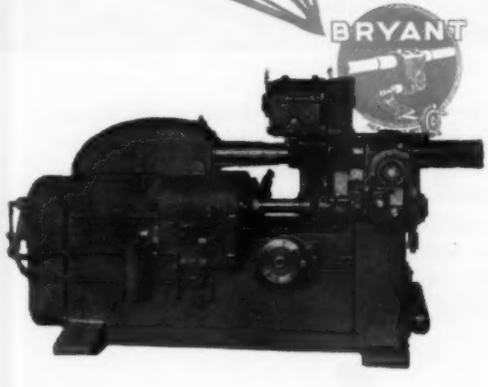
Opportunity for enterprise, both large and small . . . opportunity for initiative, regardless of size!

Small plants that before the war hung precariously on the edge are running full blast . . . knowledge and skills are being disseminated . . . fresh capital and capacity have been created . . . patent bottlenecks have been broken . . . gigantic consumer demand is resulting from shortages and increased earnings.

In short, the whole supply will be more plentiful, all competition will be keener after this war.

No matter whether your business is large or small, in planning production toward post-war prosperity there is one thing that you can do now:

Write today to Bryant! Send us your internal grinding problems! Bryant engineers are among the most qualified in America to study your future plans and offer you definite, detailed recommendations.



BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U.S.A.

JUST PUBLISHED

. . . . a book which holds the answer to simple milling problems

If you've recently become a milling machine operator or want to brush-up on the fundamentals of milling, you'll want a copy of our new booklet titled, "The Right and Wrong of Milling Practice."

Hundreds of drawings quickly show you why a job should be milled a certain way. Short cuts, better workmanship, correct care and attention of the machine — all are covered in this outstandingly different book.

Now, more than ever, our Country needs increased production, accurate work. Let this booklet help you to help your Country. You may have your copy Free by writing to Dept. C, Kearney & Trecker Corporation, Milwaukee, Wisconsin.

For production men with "headaches"

If you have a production problem which involves milling machine equipment, it's very possible that our Emergency Production Service Department can help. Send a wire, stating your problem clearly. If we can answer it by phone, mail or wire—fine! If not, we'll get one of our Emergency Service Men, who cover the country, headed your way. Of course, there is no obligation involved. It is just an added service to help you help our Country keep the Axis on the run.

P. S. Have you thought about using a Milwaukee Attachment on your present equipment? Hundreds of plants have solved their production problems this way.

EMERGENCY PRODUCTION SERVICE DEPARTMENT

KEARNEY & TRECKER CORPORATION
Milwaukee • Wisconsin

The Shipbuilding Industry *Couldn't wait!*

. . . small sub-contract shop uses Midgetmill attachment to step-up production!

Recently a small machine shop in the South, doing sub-contract work for a shipbuilding yard, was faced with a production problem. They were making semi-steel gear reduction cases on which it was necessary to drill several holes for oil pipe connections. The holes were at different angles and various depths. *All the shop had was one milling machine* and several lathes. When called in by the big "boss," our Emergency Production Service man recommended using a Milwaukee Midgetmill

Milwaukee . .

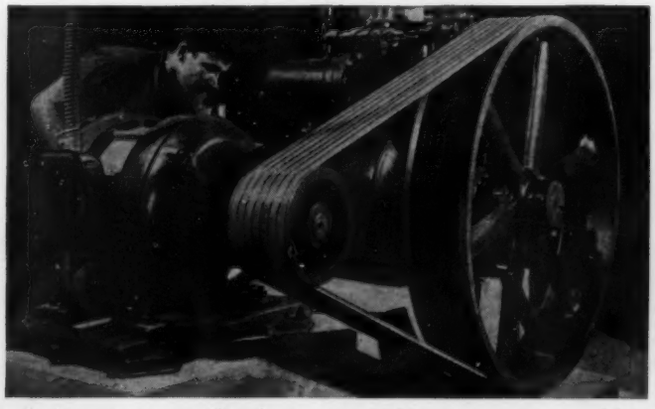
with the standard Thou-Meter in conjunction with the single milling machine. He showed him how all the holes could be drilled in one location by swinging the head of the Midget-mill to the required position. The Thou-Meter quickly enabled the operator to get the proper depths. Best of all — costly fixtures were not required . . . This is another actual story taken from our files in which an attachment solved a production problem. May we help you with yours?

KEARNEY & TRECKER
CORPORATION

MACHINE TOOLS

It's Time to Look at Motor

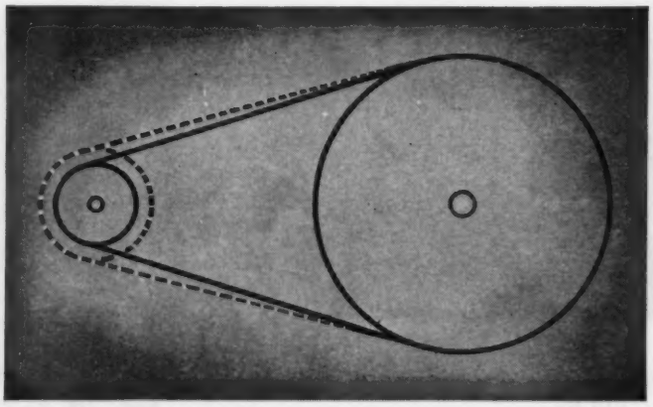
➔*You Can Save with High-Speed Instead of*



1. In most applications, an 1800 rpm motor with Texrope Drive will ably do the job of a lower-speed, direct-connected motor . . . *and* give you *exactly* the speed you want — *at lower cost!*

2. When you buy an 1800 rpm instead of 450 rpm 15 hp squirrel-cage motor, for example, 600 lb of critical materials are saved. And *you* save well over $200—with the drive figured in! This saving is typical.

➔*You Can Save with Single-Speed Instead of*



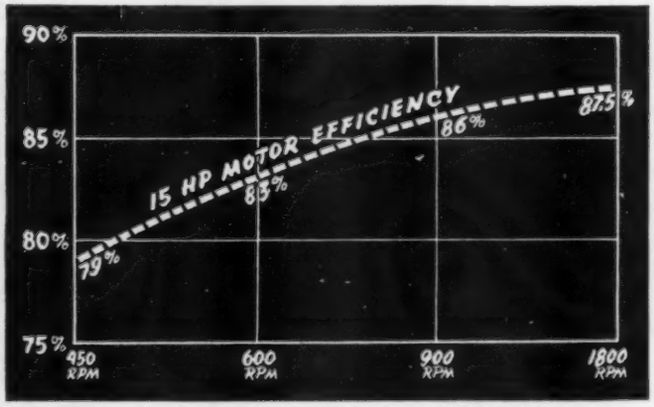
1. Infrequently needed speed changes can be had by changing from one size motor sheave to another. By juggling *complete* drives, speeds can be changed over the full range — from 1:1 to 7:1.

2. With the Allis-Chalmers Vari-Pitch Sheave, you can increase or decrease speed by adjusting sheave diameter, as above. Within limits, an unbroken series of speeds can be obtained.

Take a Fresh Buying!

WAR FORCES HIGHER EFFICIENCIES...

Low-Speed Motors...



3. Note that efficiency rises from 79% for a 450 rpm motor to 87.5% for a 1800 rpm motor. Comparing power consumption, the 1800 rpm motor saves you over 30 kw/24 hr. day.

Multi-Speed Motors...

3. Allis-Chalmers Vari-Pitch Speed Changer gives you infinite changes at the turn of a wheel — within 3.75 to 1. It's the most compact, flexible variable-speed transmission available.

It was good business in peacetime to use — as widely as possible — high-speed motors with Allis-Chalmers Texrope Drives...and single-speed motors with Allis-Chalmers Vari-Pitch Sheaves and Speed-Changers. And it's clearer every day that those material and money-saving practices are *vital* practices in time of war!

TODAY the whole picture of buying and applying motors has changed. Note at the left how much you can save for your country *and yourself* with high and single-speed motors made flexible by Texrope Drives.

As America's only builder of both electric motors and V-belt drives,* Allis-Chalmers has long advocated the proper combining of motor and V-belt drive.

And today you benefit from Allis-Chalmers' vast, pioneering experience in this field when you ask for and get the *right* combination of Lo-Maintenance Motor and Texrope Drive! Call your nearby district office. Or write ALLIS-CHALMERS MFG. CO. MILWAUKEE, WISCONSIN.

A 1560

*Allis-Chalmers *originated* the Multiple V-Belt Drive and Vari-Pitch Sheaves.

ALLIS-CHALMERS A-C MILWAUKEE

WE WORK FOR VICTORY WE PLAN FOR PEACE

Eyes for our

Submarines

By using simultaneously three separate carriage and apron units on the 22″ Monarch lathe, accepting 40 feet between centers as illustrated below, a fast three-lathes-in-one job of machining marine tubes for our Navy is accomplished. With the tubes supported in five equally spaced steady rests, close tolerances are maintained without difficulty.

This example indicates how Monarch lathes are being used for fine accurate finishing of extra long work, such as gun barrels, ship-shafts and similar pieces. Whether the operation consists of straight turning, combined straight and taper or contour turning or boring, Monarchs do the job quickly and to required rigid tolerances.

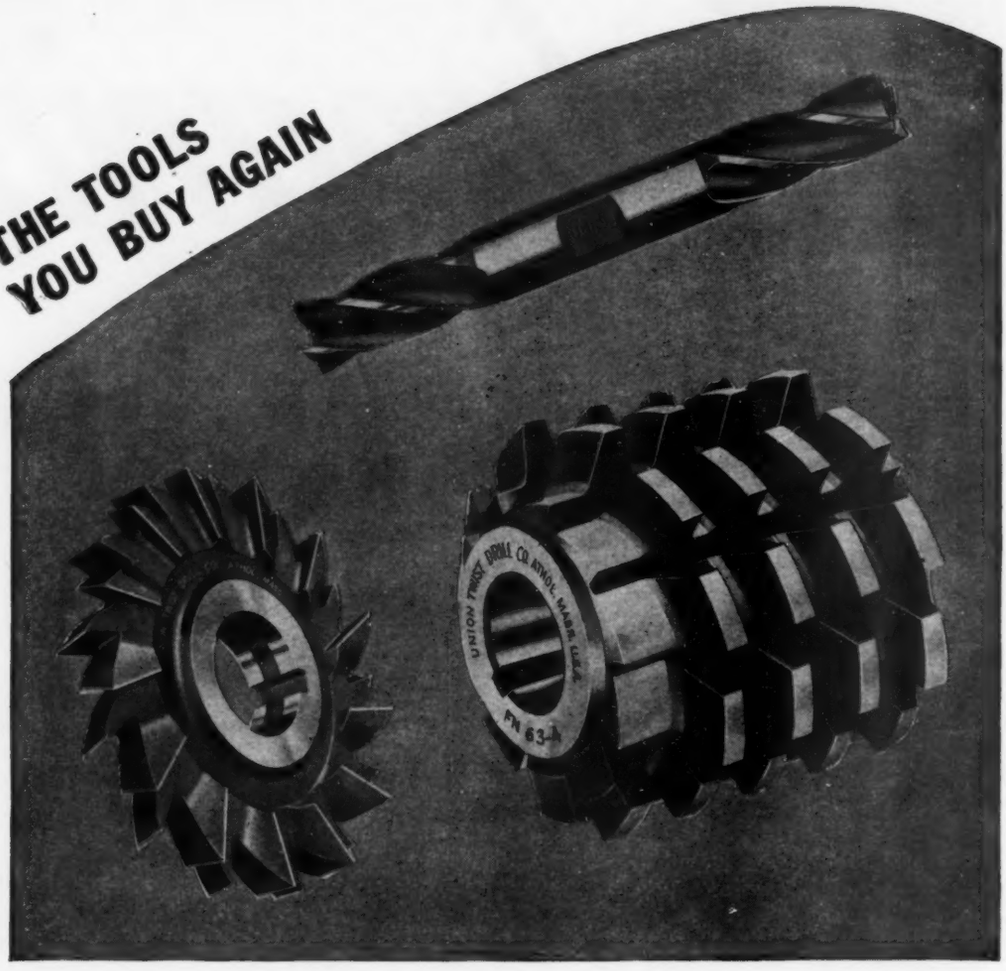
Monarch lathes are at work throughout our Naval and Maritime operations, speeding the building and equipping of ships.

THE MONARCH MACHINE TOOL COMPANY • • • SIDNEY • OHIO

MONARCH LATHES

COVER THE TURNING FIELD

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws —End Mills—Taps— Dies—Screw Plates— Profile Cutters.



SMALL TOOLS FOR BIG SAVINGS

Union's eminent position in the small tool field is the result of the meticulous care taken in the selection of materials, specialized and competent metallurgical experience, modern manufacturing facilities and rigid inspection. Small tools by Union make big savings in cutting time, assure accuracy and more cuts between grinds because every care is taken in every phase of production to realize faster cutting, higher cutting efficiency and more economical results.

You can buy UNION TOOLS on faith—and you'll continue to use them for performance.

UNION TWIST DRILL COMPANY

ATHOL, **MASS.**

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

Representatives throughout the world

UNION

MORE *man* POWER TO YOU!

Automatics machine more pieces, in less time, in less space, with less waste. They save man hours.

The Conomatic single overhead camshaft makes more room for tooling, cutting oil and chips. Their feed and speed ranges are adequate for any job within their capacities.

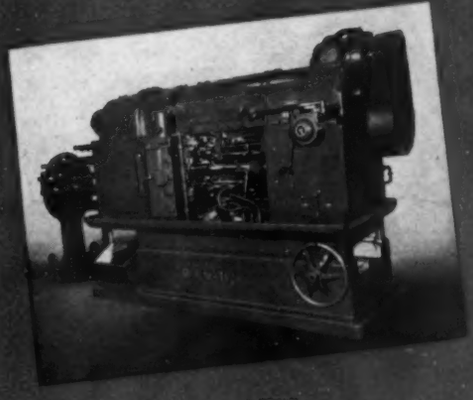
An operator should know his machine, and Conomatics are designed for ready understanding.

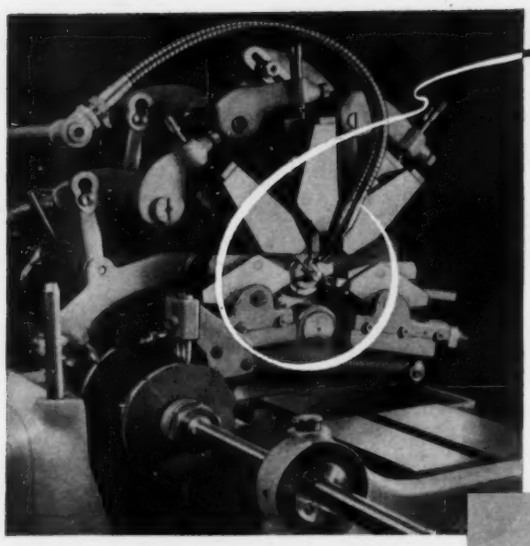
Experienced operators usually understand any automatic. Start your new men with Cones.

Your new men will learn quickly on Cones.

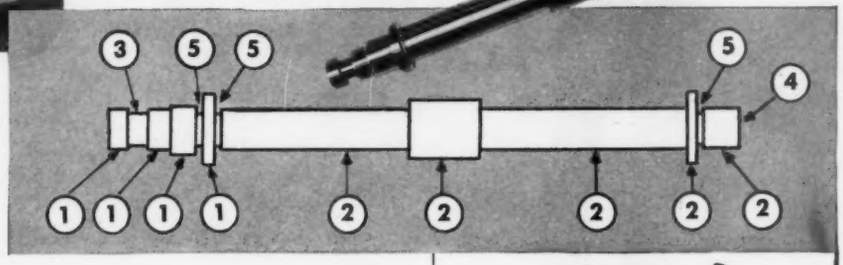
CONE Automatic Machine Company, Inc.

Windsor, Vermont, U.S.A.





Five Individually Cam-Fed Tools OPERATING EXTREMELY CLOSE TO WORK GUIDE BUSHING



A Principal Reason For The

HIGH FINISH
EXTREME ACCURACY
UNVARYING CONCENTRICITY

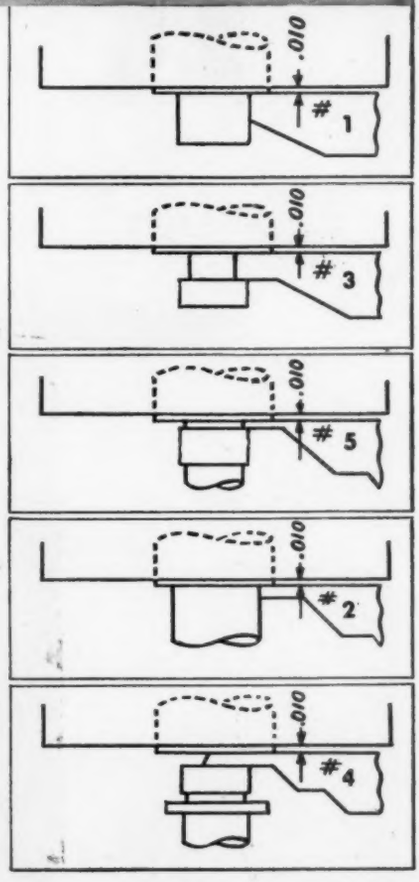
Produced By This Machine

Shown above is a part typical of those produced on the Wickman High Precision Automatic. To secure the various diameters, undercuts and cut-off, five individually cam-fed single point tools are employed. The sliding headstock is also operated by a cam and controls the various lengths. Identified by number on the line drawing of the completed part, and in cutting position in the drawings at the right, are the tools used to perform each operation.

It is to be noted that, in producing this part, the tools are supported very close to the contact point. At no time is it ever necessary for the cutting tools to operate further than 1/32" from the guide bushing.

All tool holders are provided with both radial and lateral micrometer adjustments. The collet capacity is up to 1/2" diameter, and maximum turning length is 4". 28 spindle speeds up to 7000 R.P.M. and infinite feed rates are available. Attachments for drilling, threading, tapping and slotting can be supplied as standard accessories.

A NEW EIGHT PAGE BOOKLET, COMPLETELY DESCRIPTIVE OF THE OPERATION AND CONSTRUCTION OF THIS MACHINE, IS JUST OFF THE PRESS. WRITE FOR IT.



SPECIFICATIONS OF PART SHOWN

Part - 3-27/64" long - ten diameters between 5/32" and 23/64" - three undercuts.

Material - Stainless steel - Black and Red.

Production - Approx. 12 pieces per hour.

Tolerance - ±.0005" on all diameters.

Finish - 25 to 30 Micro-inches.

(SWISS TYPE)

WICKMAN HIGH PRECISION AUTOMATIC

THE Wickman CORPORATION

15539 WOODROW WILSON AVE.
DETROIT, MICHIGAN

TOUGH GOING
but they can TAKE IT!
KEMPSMITH
ADAPTING KEMPSMITH NO. 2 FOR HEAVY DUTY FACE MILLING JOB . . .
This standard No. 2 Kempsmith Type G Miller, equipped with heavy duty vertical attachment and 12" dia. face milling cutter, is removing ¼" stock from a semi-steel gear case. Just another example of power and ruggedness, typical of all Kempsmith Millers during the past 54 years.
KEMPSMITH MACHINE CO.
MILWAUKEE, WIS., U. S. A.
KEMPSMITH

to help YOU do a

in the production of STAINLESS PARTS

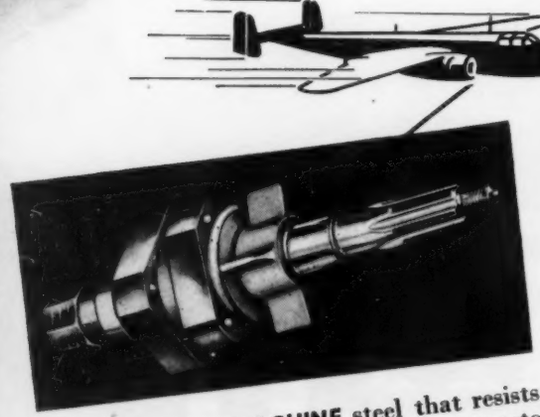
- ***HINTS*** **on how to get the most from every pound of Stainless Steel you use.**

- ***TIPS*** **on how to increase production, how to do the job better.**

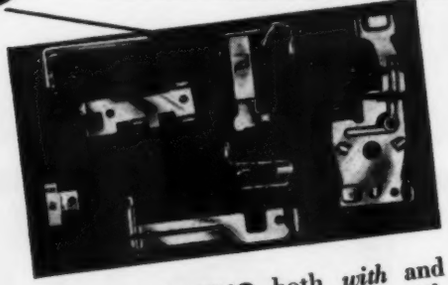
You and your men no doubt know many short-cuts as a result of your experience in fabricating Stainless Steel. We'd like to help you add to that knowledge by giving you the benefit of our experience in solving Stainless problems.

So we are passing along some of the suggestions collected from Carpenter metallurgists, research men and service representatives. Most of these men have devoted a good part of their lives to solving Stainless problems. Today, through their efforts, better and faster fabricating methods are available to war production plants.

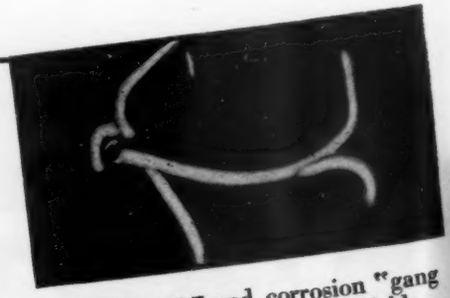
In many of these plants, Carpenter men are being asked to solve special corrosion and heat resistance problems . . . and then work out faster fabricating methods. Because time is short, they can not be everywhere at once. But much of their experience can be made available to you through these pages, and by correspondence with the mill . . . Write us about your specific Stainless problems.



EASY-TO-MACHINE steel that resists corrosion is needed for making magneto shafts like this . . . so Carpenter Free-Mashining Stainless is used to eliminate many production headaches.



SEVERE BENDING both *with* and *against* the grain is no problem with soft and ductile Carpenter Stainless Strip. Then too, these switch parts must be made to close tolerances—with fewer rejects—an easier job with this Stainless Strip.



TERRIFIC HEAT and corrosion "gang up" on airplane exhaust manifolds—so Stainless is used to make the trip "home" possible. (And it is here that the high strength/weight ratio of Stainless improves product performance.)

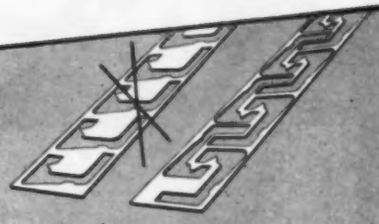
a trouble-shooting job

Adjust Press Speeds For MORE Output!

Perhaps your press speeds are OK. Maybe faster speeds should be tried. A quick check-up may even show that a reduction of 10 to 15% would increase output and conserve metals. Often, slower press speeds will overcome die galling that can spoil parts and interrupt production.

Saved: 30,000 Pounds of Stainless!

From 45,000 lbs. of Stainless Sheet to only 15,000 lbs. of narrow Stainless Strip—for making the same number of parts! Saved: 30,000 lbs. of vital metal, *and* the time required to slit and handle sheet. Check the use of narrow Strip on your jobs where Sheet is used.

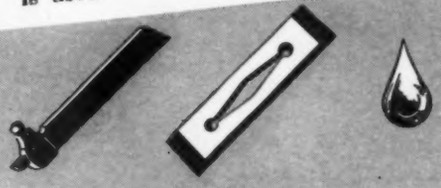


Re-Check Layouts ---NOW!

Keep your skeleton scrap losses to an absolute minimum. Spend a few hours now to re-check layouts on jobs that are stamped from Strip. The results will be well worthwhile . . . in terms of metal conserved and time saved.

"Tell All" to Your Supplier . . .

Tell your supplier about your punch press problems, your machining difficulties and high percentage of rejects. He made the material you use, and can probably offer plenty of good, solid help and useful information.



How About . . . Tools? . . . Dies? . . . Lubricants?

Frequently, an analysis of your tool, die and lubricant set-up will point the way to getting rid of tough production "bugs". A complete review of procedure can do a lot to help you boost output and conserve much-needed metals.

"Much scrap. So happy." Check Your Rejects . . .

Material that is not uniform throughout can cause many a headache such as wrinkling in the die. Tearing and galling can also result from using off-size material. But *whenever* rejects are high, it pays you to check *all along the line.*

AND remember that your Carpenter representative and our Metallurgical Department can provide on-the-spot help . . . to enable you to beat your really tough problems.

The Carpenter Stainless Slide Chart is a useful "assistant" to have at your elbow. It provides data on the welding, heat resisting and machining properties, etc. of each Stainless Steel. A note on your company letterhead will bring you a Carpenter Slide Chart—free to Stainless Steel users in the U.S.A.

THE CARPENTER STEEL COMPANY, 109 Bern Street
Reading, Pennsylvania

more than corrosion resistance

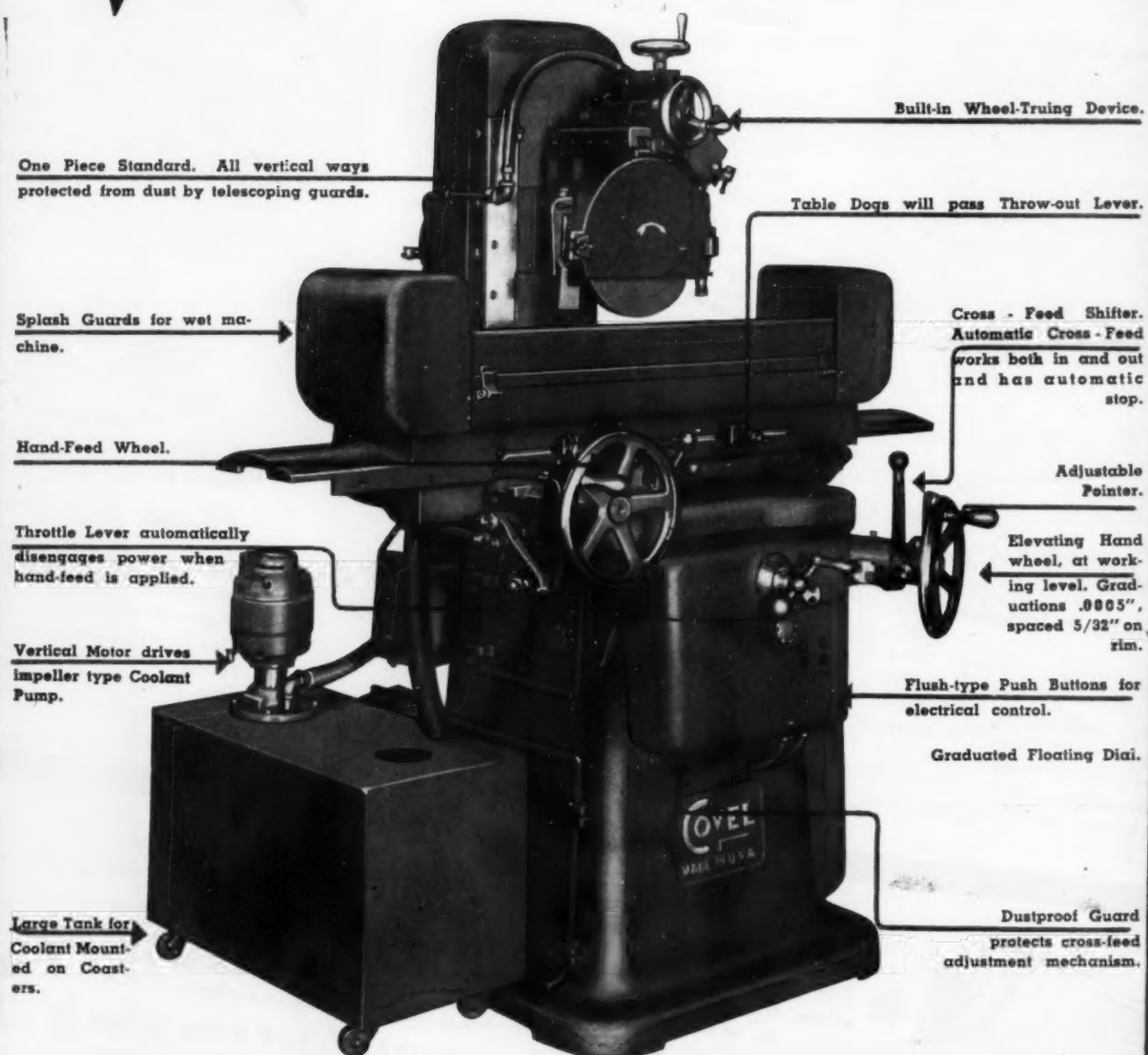
Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

14 Star SERVICE FEATURES

—for PRECISION *PLUS* HIGH SPEED!

War production demands *precision* PLUS *high speed*. That's why these 14 STAR SERVICE FEATURES of Covel No. 5 Surface Grinder are appreciated by owners everywhere. Covel Bulletin 841 shows in detail why the No. 5 will increase your production, minimize rejects, and reduce costs on a wide variety of surface grinding jobs. Write today for your copy and name of nearest dealer.


Built-in Wheel-Truing Device.
One Piece Standard. All vertical ways protected from dust by telescoping guards.
Table Dogs will pass Throw-out Lever.
Splash Guards for wet machine.
Cross - Feed Shifter. Automatic Cross - Feed works both in and out and has automatic stop.
Hand-Feed Wheel.
Adjustable Pointer.
Throttle Lever automatically disengages power when hand-feed is applied.
Elevating Hand wheel, at working level. Graduations .0005", spaced 5/32" on rim.
Vertical Motor drives Impeller type Coolant Pump.
Flush-type Push Buttons for electrical control.
Graduated Floating Dial.
Large Tank for Coolant Mounted on Casters.
Dustproof Guard protects cross-feed adjustment mechanism.

Covel No. 5 Hydraulic Feed Surface Grinder (8" x 24") equipped for wet grinding

Grinding Machinery Since 1874

COVEL

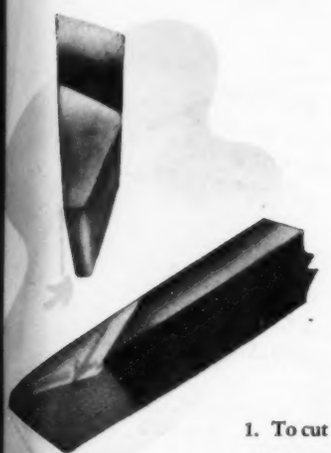
COVEL MFG. CO., BENTON HARBOR, MICH.

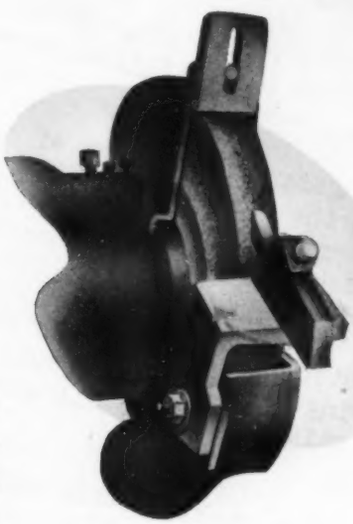
I'm Tellin' You..

No. 5 in a Series of Tips on "Keeping 'em Turning"
by John Stephens, 41 years at LeBlond

One of the most common causes of trouble in lathe work is a dull or improperly ground tool. I'd like to illustrate a few of the correct steps for giving first aid to "beat up" tools. The best method is the semi-automatic grinding machine.

If your tool room has one, let the expert in charge do your grinding. But if you do your own grinding by the offhand method, watch these points.

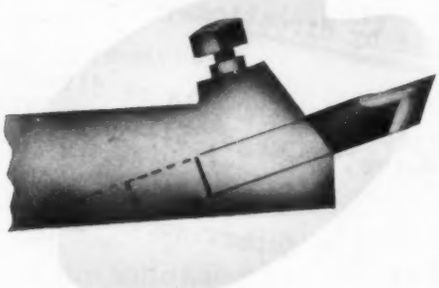




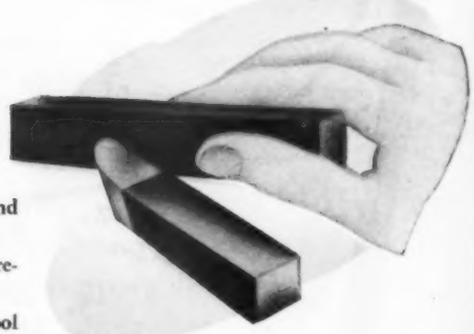
1. To cut free a tool must be ground with four correct angles—side clearance (top drawing) and back rake, side rake, and end clearance (shown on bottom drawing). These angles as well as the shape of the tool vary with the material to be machined. Refer to a tool manufacturer's manual.

3. The tool is supported on the work rest and moved with a rocketing motion over the face of the entire grinding wheel. This prevents the tool from turning and distributes wear on the wheel.

4. Tools used for finishing or for soft metals should be further sharpened with light strokes of an India oil stone. Use of this stone is also recommended between cuts. For roughing this last step is unnecessary.



2. The most satisfactory way to grind a tool bit is in its own holder. To prevent grinding the holder, extend the tool beyond its regular cutting position.



ARMY NAVY

THE R. K. LeBLOND MACHINE TOOL CO.
Cincinnati, Ohio

Largest Manufacturer of a Complete Line of Lathes

70-137

WAR DEPARTMENT
ARMY AIR FORCES
MATERIEL CENTER
OFFICE OF THE DISTRICT SUPERVISOR
CENTRAL PROCUREMENT DISTRICT
8505 W. WARREN AVE.
DETROIT, MICH.

July 13, 1942

PRODUCTION SECTION
CENTRAL PROCUREMENT DISTRICT
MANUFACTURERS' LETTER NO. 10
CHICAGO AREA OFFICE

SUBJECT: Cemented Tungsten Carbide for Cutting Tools

1. The following is quoted from memorandum, dated June 19, 1942, from the War Department, Headquarters, Services of Supply, Washington, D.C.:

"In the interest of conservation of critical alloys and of increased production, attention is directed to the following stated advantages of cemented tungsten carbide tools . . .

"a. One pound of tungsten in the form of cemented tungsten carbide for cutting tools will do the work of 70 to 100 pounds of tungsten in high speed tool steel. Furthermore, its use eliminates substantial amounts of chromium and vanadium which are considered necessary components of practically all high speed tool steel.

"b. Cemented tungsten carbide functions satisfactorily on almost all types of lathes and boring machines, particularly those of the sturdier construction. This is said to include all such machine tools manufactured in the last five years.

"c. Cemented tungsten carbide works efficiently on all steels above approximately .30 carbon and is effective up to 500 brinell or more.

"d. Cemented tungsten carbide will give two or three times the production of high speed tool steel in those operations to which its use is adapted and over a given run will require about one-fifth the number of grinds that standard high speed tool steel will require."

2. This information is forwarded by direction, Wright Field letter, EAZ-ar-72-2, (July 3, 1942).

3. Any requests for further information should be directed to the AAF Chicago Area Office, 20 N. Wacker Drive, Chicago, Illinois, Attention: Production Section.

For the District Supervisor:

HARLEY S. JONES
Lt. Colonel, Army Air Forces
Technical Executive

CENTRAL AIR CORPS PROCUREMENT DIST. OFFICIAL WAR DEPT. DETROIT, MICH.

Distribution: 1-B Manufacturers in CPD

NOTE: In the reproduction of the above letter by Firth-Sterling, it is to be understood that it does not imply the WAR DEPARTMENT'S indorsement of any company's products.

YOU CAN DO IT WITH

FIRTHITE

TUNGSTEN - TITANIUM CARBIDES

FOR STEEL CUTTING

FIRTHITE T-04*

Universal grade for heavy duty, interrupted cuts, and coarse feeds, on older machines.

FIRTHITE TA*

General-purpose grade for cutting steels under "average" conditions.

FIRTHITE T-16*

The grade for fine, extremely fast machining of steel.

FIRTHITE T-31*

Hardest, wear-resistant, premium grade for precision boring, etc.

* **TITANIUM** in these FIRTHITE grades makes possible better, faster, cheaper cutting of steel and at the same time permits tool prices comparable with those for high-speed steel. These FIRTHITE grades are made under one or more of the following patents on **TITANIUM** Carbides: 1,925,910; 2,023,413; 2,246,387; 2,265,010; Re. 22,073; Re. 22,074; Re. 22,166; Re. 22,207.

Firth-Sterling

STEEL COMPANY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

He Never Has to Take His Eyes Off the Cutter and Work

DEVLIEG JIGMIL

Spindle start, stop and reverse—

Power vertical feed and rapid traverse movement—

Power horizontal feed and rapid traverse movement—

Power automatic table retraction and repositioning—

Power feed and rapid traverse to bar movement—

are all carried in a master switch on the spindle head—at the operator's finger tips.

Thus, the operator of the DeVlieg Jigmil can fix his vision on the cutter and work—never has to look at controls during operation.

The Jigmil is what a machine tool should be—a powerful and accurate extension of the operator's hand. The value in precision boring and milling is apparent.

It's a NEW *Type Machine*

Spacing Accuracy of a Jig Borer . . . Performance Qualities of a Milling Machine . . . Convenience and Flexibility of a Horizontal Boring Mill.

New speed of operation . . . New standards of excellence of bored holes . . . New accuracy in milling . . . Automatic table retraction and repositioning dependable within .0002".

Many machines show 75% greater average daily productivity.

Write for Circular
DEVLIEG MACHINE TOOLS

DE VLIEG MACHINE COMPANY

450 FAIR AVENUE, FERNDALE (DETROIT), MICHIGAN

Thompson

SPRING TOOL HOLDER

No cutter breakage No damaged work and no chatter

The Willard Spring Tool Holder, a Thompson product, is versatile—adaptable to a wide variety of uses and gives consistent, efficient and economical results. For threading, the "Willard" produces smooth, accurate threads close to shoulder—can be used for coarse or fine threads without danger of chatter or tool marks. When used as a forming tool it assures faster, smoother machining free from cutter marks—ratchet design prevents cutter from forming under heavy loads—no side sway. The Cutting-off Tool Holder makes possible faster feed with a heavier feed because of the "Willard" spring feature.

Send for further information on the Willard Spring Tool Holder—the holder that eliminates chatter, cutter breakage and damaged work.

THREAD TOOL GRINDING FIXTURE

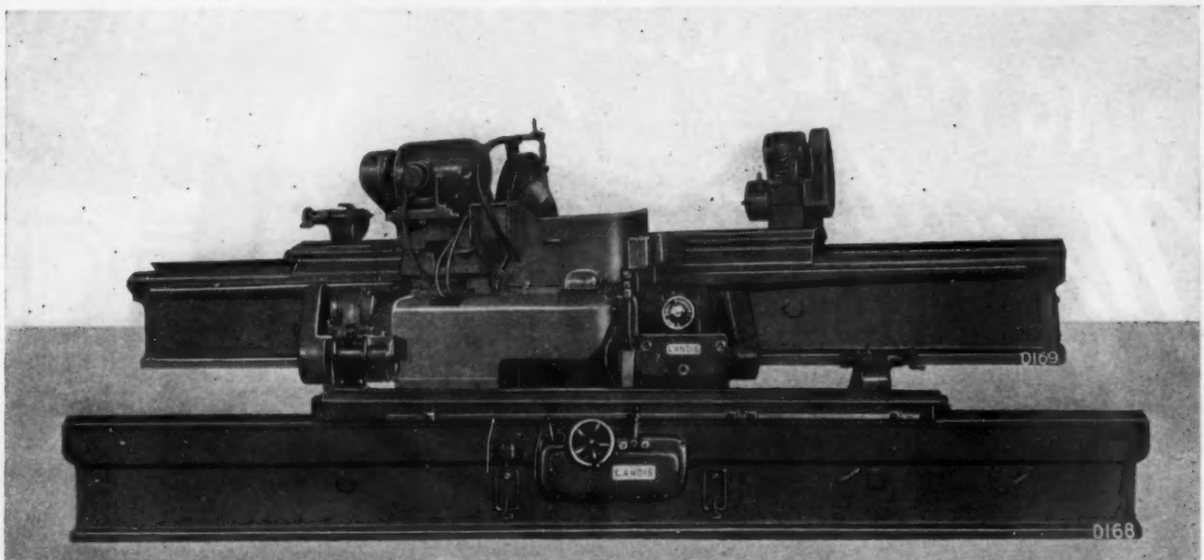
Above illustration shows a 60° thread cutter being finished ground. By reversing fixture, the cutter is accurately ground to correct angles in a few minutes — grinds square thread tool bits to a 60° or 29° angle with a 15° cutting rake — holds square cutters in sizes 3/16" to 3/8"

AUTO-ORDNANCE Corporation

THOMPSON TOOL DIVISION

342 WEST PUTNAM AVENUE, GREENWICH, CONN.

To Finish The Job Quicker ...



"At this time it gives me great pleasure to report to you that the 14" x 120" Plain Hydraulic Grinder has, since its installation, performed beyond all expectations both in quality and quantity of work turned out on this machine."

We never solicit testimonial letters. That's why we are reproducing the above closing paragraph of a letter which recently came to us.

It undoubtedly represents the sincere feeling of its writer who is none other than the shop superintendent of a well-known manufacturing organization. Because of the nature of the work being performed in this plant, we are not at liberty to mention details. Nothing, however, could bear more eloquent testimony to the performance of modern Landis Type C Plain Hydraulic equipment than the statement that it is performing beyond all expectations both with respect to quality and quantity of output.

Modern design features and the widely recognized willingness of Landis engineers to give freely of their experience are the chief elements which create users' satisfaction as expressed on this page.

If this combination is not working for you, why not investigate its possibilities — now?

Unusual Performance As Usual

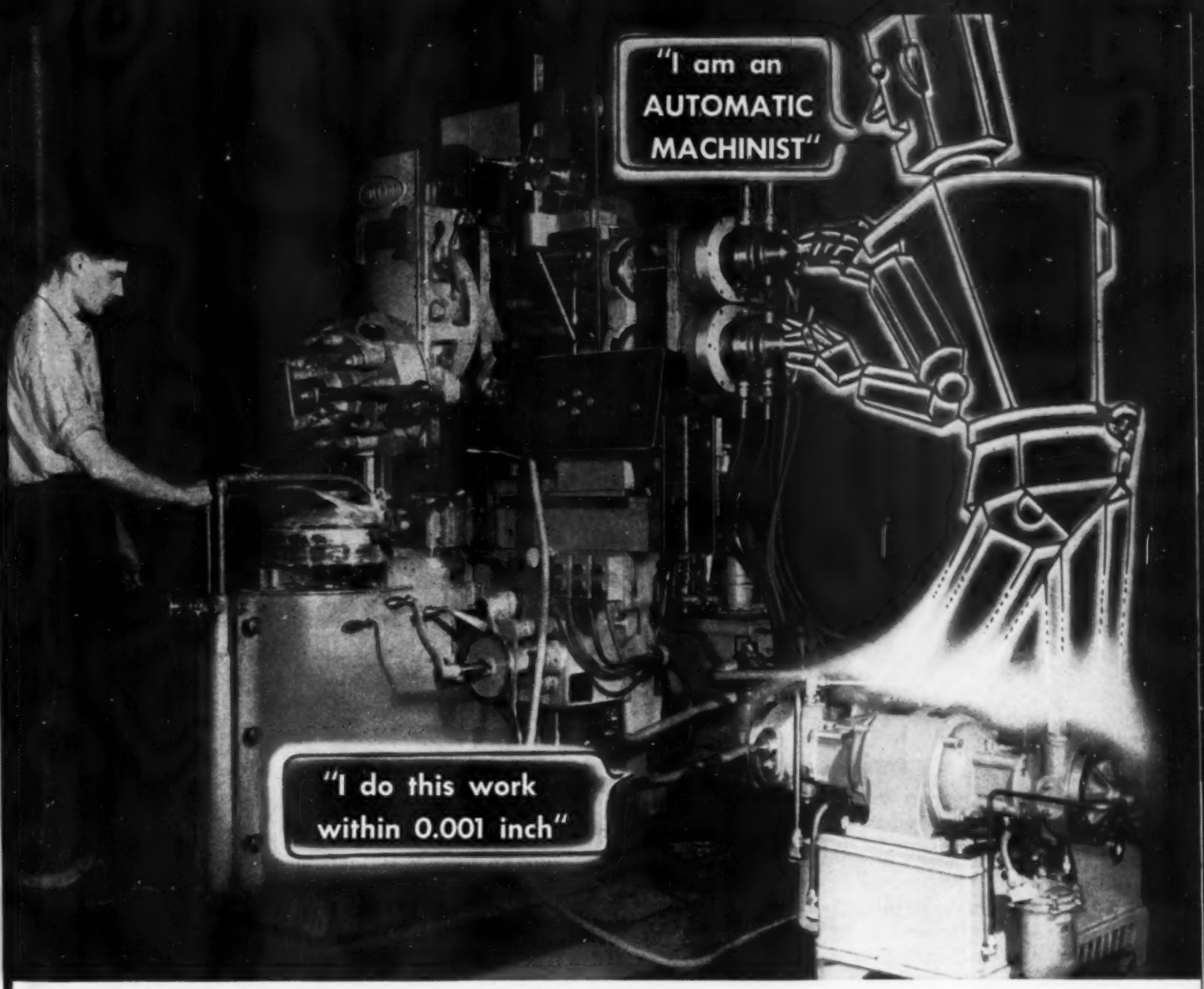
PRECISION LANDIS GRINDERS

LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA.

LANDIS EXCELLENCE

CONTRIBUTES TO VICTORY

408



Get this *AUTOMATIC,* ERROR-PROOF OPERATOR and get 7 TIMES MORE PRODUCTION from *your present standard* tool room tools.

A DUPLIMATIC will automatically turn one, or two, or three feed screws of almost any machine tool, automatically, simultaneously! It will permit almost any standard machine tool to be converted over to mass production contour machining at accuracies that will astonish you.

It is uncannily human, yet it operates with absolute certainty.

No human operator could possibly turn the two feeds on this vertical lathe to form-turn this ordnance part at required speeds of production and at the limits demanded. Yet DUPLIMATIC does it easily, accurately and at speeds that exceed the original specification.

DUPLIMATIC "FITS" ANY MACHINE

DUPLIMATIC Single, Dual or the three dimensional "Special"—can be quickly connected up with any standard tool room tool. A few hours to connect the drive heads to the feed screws; a few more to show the operator how simple DUPLIMATIC is to handle and *mass production at tool room limits has started!* An average of 7 times more production than with manual operation alone is the well-established record of DUPLIMATIC.

WHO USES DUPLIMATIC?

The biggest producers of war goods use DUPLIMATIC: Pontiac, Cadillac, Chevrolet, Chrysler, DeSoto, Pullman and Pressed Steel Car, A. O. Smith—to mention just a few.

When your Pet Machinist gets drafted . . .
draft DUPLIMATIC

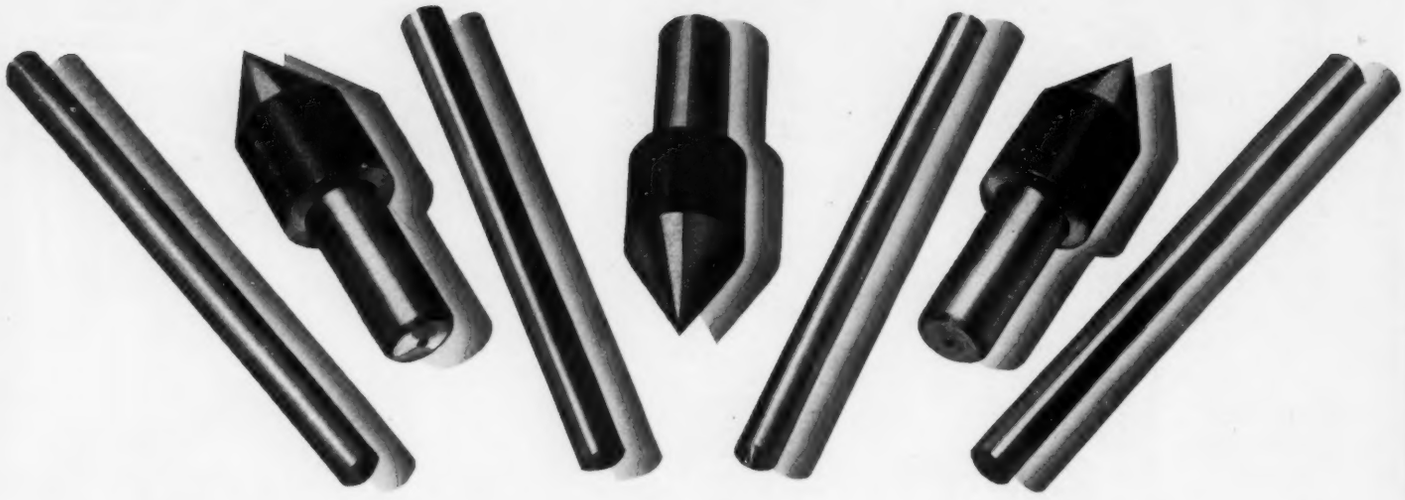
Send for complete details NOW!

DUPLIMATIC
and your present tool room tools will do more contour machining faster, more accurately and with less skilled help.

DETROIT UNIVERSAL DUPLICATOR CO.

737 E. Milwaukee Ave. Detroit, Michigan

CLEVELAND *Single Spindle* AUTOMATICS SAVE 50% IN COST, RELEASE TWO OTHER MACHINES IN WHITMAN & BARNES SMALL TOOL PRODUCTION



● "Bottle-necks"—in small tool production—are avoided by all small tool manufacturers supplying plants engaged in producing war materials and tool makers are unceasingly alert to further reduce the *possibility* of "bottle-necks." At Whitman & Barnes this was found possible in production of center reamers and jobber drills, both made of high speed steel, by the installation of Model B Cleveland Automatics.

The center reamer blank shown is produced in lots of 200 pieces from 1 1/16-inch bar stock which subsequent to pointing, cutting fillet, turning and cutting off is reduced to ½-inch diameter. Says the Foreman, "Model B performance is very good; it is excellent for holding size and concentricity."

Model B Clevelands are built up to 2½-inch bar capacity for thousands of metal turning jobs where production quantities are demanded. They are used on such work as shafts of multiple diameters, various types of studs, nipples, tap blanks and pins, required in quantity, but made accurately. Built in short and long lengths, to accommodate work up to 18-inch stock feed, Model B cutting tools can be mounted singly or in series for turning one or more diameters of various lengths. Model B has double cross slides for forming tools and overhead slide for independent cut-off.

Model A Cleveland Automatics are built in 3¾-inch to 8-inch sizes with 4-speed motor drive, universal camming and variable tool feed. In 1 1/16-inch to 2½-inch sizes constant speed drive is standard, but 2-speed drive is optional at slight extra cost. Ask for Bulletins describing the size interesting to you of either Model A or Model B, or both.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

2269 ASHLAND ROAD · CLEVELAND, OHIO

Sales Offices: CHICAGO: 20 North Wacker Drive, Civic Opera Bldg., Room 1408

DETROIT: 540 New Center Building · NEWARK: 702 American Insurance Building · CINCINNATI: 507 American Building

★ ★ ★ ★ ★ ★ ★

Consider **Cleveland *Single Spindle* Automatics if you make duplicate parts in small quantities. By using *single spindle* automatics the increased production obtained from them may release a number of other critical machine tools for other purposes.**

CLEVELAND *Single Spindle* AUTOMATICS

MODEL A—Built in 1 1/16-inch to 9 1/2-inch capacities inclusive

MODEL B—Built in 1 1/16-inch to 2 1/2-inch capacities inclusive

The Blanchard No. 18 is a Consistent Profit Maker on Flat Surface Work

"PUT IT ON THE BLANCHARD"

Large work of thin section is usually difficult to grind. Here the Blanchard method of surface grinding shows to full advantage — the work is held on the magnetic chuck and the wheel takes broad cuts over the surface at each pass. This results in greater accuracy, finer finish, and better production — the Blanchard grinds metal at all times — not air.

Above, a No. 18 Blanchard is grinding 18″ x 24″ steel engine end plates of thin section. .020″ of stock is ground off each side to limits of ±.002″ at a production of 7 plates (14 surfaces) per hour. Note also the variety of other parts which is ground on this machine.

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- ★ **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- **Fine Finish**
- **Flatness**
- **Close Limits**

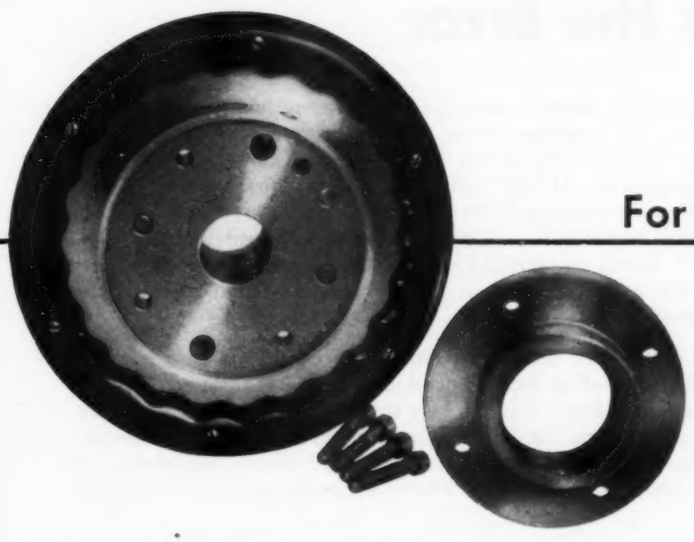
★ . . . . . *Especially valuable on jobs like the one illustrated.*

HARDINGE - SJOGREN

SPEED COLLET CHUCKS

For CAM-LOCK SPINDLES

For TAPERED KEY-DRIVE SPINDLES



For THREADED NOSE SPINDLES

Are you getting full value from your investment in tool-room and engine lathes?

A Hardinge-Sjogren Speed Collet Chuck gives greater capacity, saves time, increases accuracy and assures better results.

It is readily adapted for use on the spindle nose of your lathes, takes precision collets – enabling the operator to do better work . . . faster!

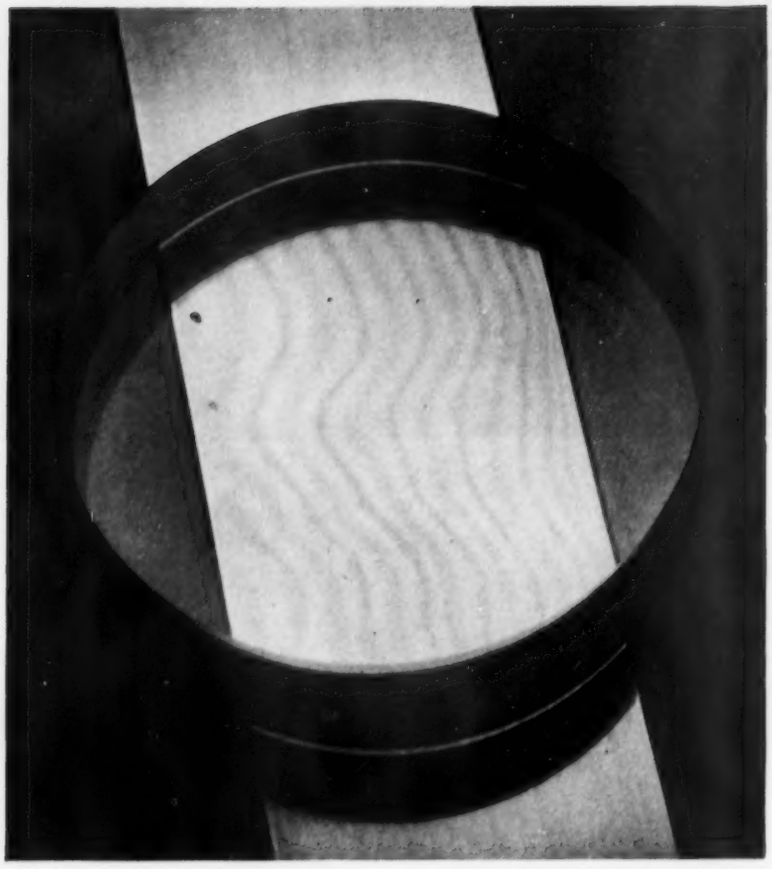
Available in three sizes: 1", 1-3/8" and 1-3/4" capacity.

Furnished with Hardinge Precision Collets.

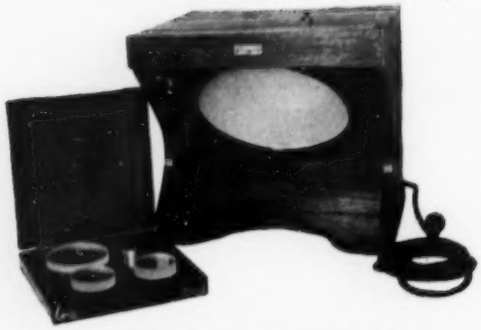
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

Maintain accuracy in your costly gages and instruments



Van Keuren LIGHT WAVE EQUIPMENT Spots the Error



Complete Light Wave Measuring Equipment consisting of monochromatic light source, working flats and master flats.

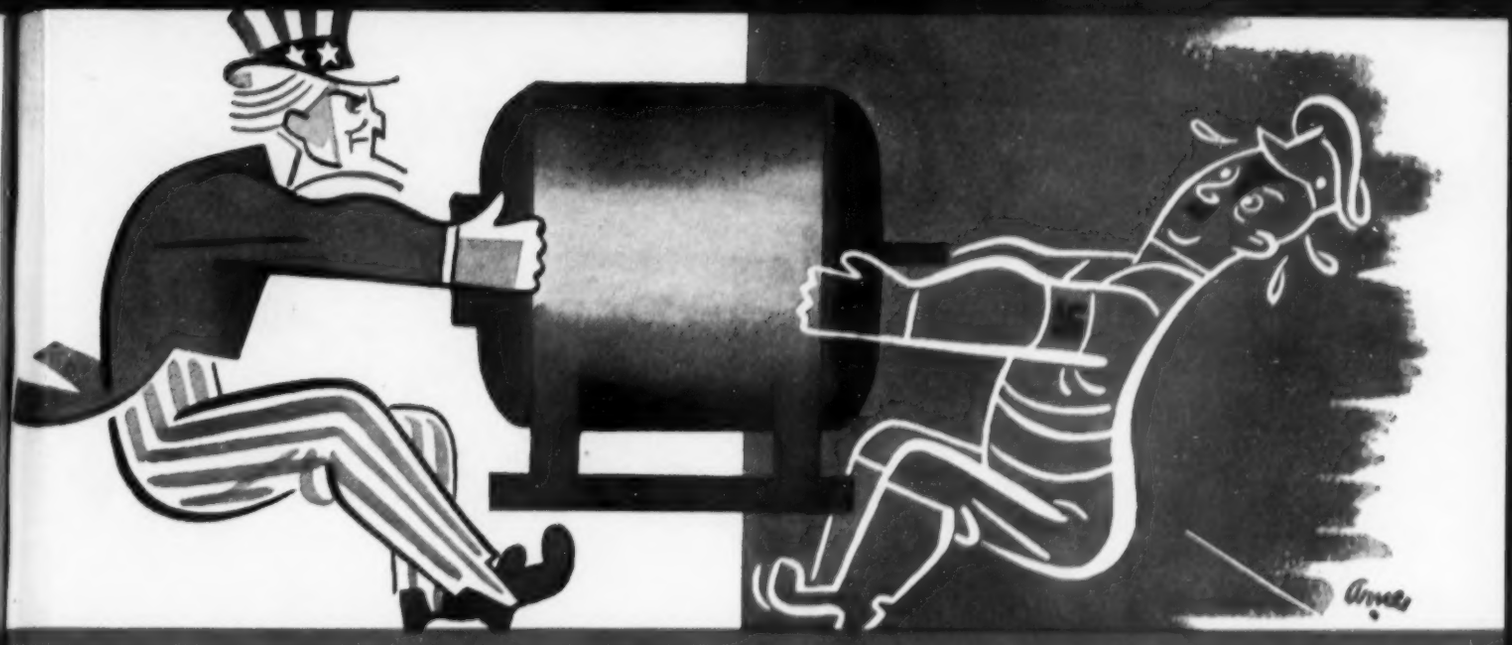
The above illustration shows a worn spot on an amplifying gage anvil—a potential source of serious errors in close-tolerance work—spotted and measured to millionths of an inch by Van Keuren Light Wave Measuring Equipment. If the light wave interference bands showing in the illustration were straight, the anvil would be flat. The bands dip an amount equal to twice the distance between adjacent bands, showing a valley 2 bands or .000023" deep. In order to maintain the accuracy of the amplifying gage, the anvil shown should either be shifted or reconditioned.

Van Keuren Light Wave Measuring Equipment offers the answer, also, in terms of millionths of an inch on production flatness tests of all types of precision lapped parts. It is the only satisfactory means of checking combination gage blocks for flatness, parallelism and size with elimination of temperature errors. Van Keuren Light Wave Equipment is standard equipment in all plants where accurate measurements are important.

Catalog No. 31 giving complete information will be sent free upon request.

THE Van Keuren COMPANY 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment · Light Wave Micrometers · Gage Blocks · Taper Insert Plug Gages · Wire Type Plug Gages · Measuring Wires · Thread Measuring Wires · Gear Measuring System · Shop Trianales



HOW MUCH OF YOUR MOTOR CAPACITY IS ON THE ENEMY'S SIDE?

APPLY THIS GUIDE

(based on recommendations of WPB)

TO DECIDE UPON MOTOR SIZE

1. For open-type a-c motors (continuous rated 40 C) where ambient temperatures are generally below 40 C, use motors rated as low as 80% of actual required horsepower. EXAMPLE: Where 9.3 is required horsepower—9.3 x .80 = 7.44; select a 7.5-hp motor.

2. For a-c or d-c motors rated on a 50 C or 55 C basis, where ambient temperatures are generally below 40 C, use motors rated as low as 91% of actual required horsepower.

3. For open-type d-c motors (continuous rated 40 C) where ambient temperatures are generally below 40 C, use motors rated as low as 87% of actual required horsepower.

4. In selecting motor types, base your choice on these conservation factors, wherever operating conditions permit:

Use standard open motors instead of "specials"—high-speed instead of low-speed—single-speed instead of multiple—single-winding rather than two-winding—a-c instead of d-c—squirrel-cage instead of slip-ring—440-volt motors instead of 220 (or use 2200 volts above 100 hp).

An up-to-the-minute guide on wartime motor selection is now included with each copy of the G-E MOTOR FITNESS MANUAL, a booklet prepared to help you get the most out of every motor you now have in service. For your copy, call or write your local G-E office.

MOTORS NEEDLESSLY LARGE FOR THE JOB—plus the oversize distribution circuits they require—may be 25 per cent or more on the side of the Axis' That's the percentage of copper and other scarce materials frequently wasted by overcautious motor specifications—by buying the "next larger size" than a machine actually needs.

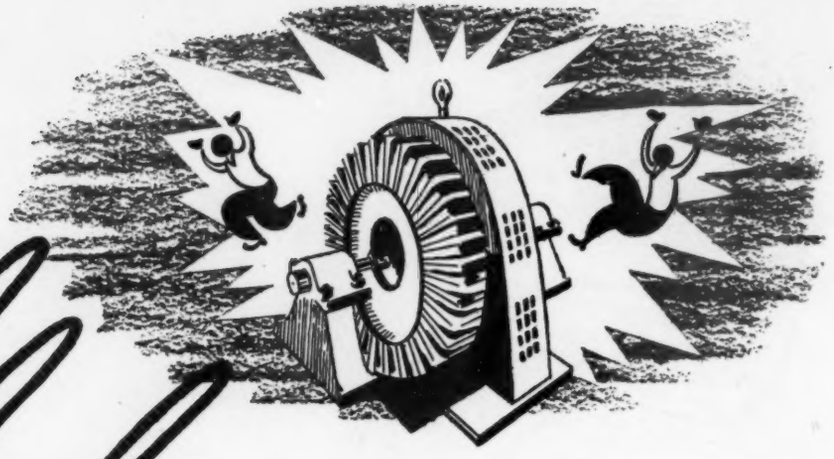
The extra amount of critical material used in the oversize motor itself is only part of the loss. Operating a motor continuously below its rated capacity can mean wasted copper all the way back to the power plant. Thus, even your present motors should be so applied as to avoid "over motoring," wherever possible.

The WPB joins in urging you to modify your peacetime motor policy in the cause of conservation. By following its recommendations whenever you buy or install a motor, you'll be helping to make more metals available where they're most needed to win the war. *General Electric, Schenectady, N. Y.*

The Navy "E", for Excellence, has been awarded to 93,780 General Electric employees in six plants manufacturing naval equipment.

BUILDER OF TRI/CLAD MOTORS

GENERAL ELECTRIC



Flashover AT 10 PM

back on the line next afternoon at 3

200 KW GENERATOR FLASHED OVER AND GROUNDED—WAR PRODUCTION HALTED AT 10 PM. UNIT DISMANTLED, NEW BRUSHHOLDER INSULATION TUBES MADE UP (BY NEAREST WESTINGHOUSE MANUFACTURING & REPAIR PLANT), RUSHED BACK TO THE PLANT AND INSTALLED. GENERATOR BACK ON THE LINE AT 3 PM. SEVENTEEN HOURS FROM PRODUCTION STOPPAGE TO PRODUCTION AS USUAL.

Westinghouse
MANUFACTURING AND REPAIR

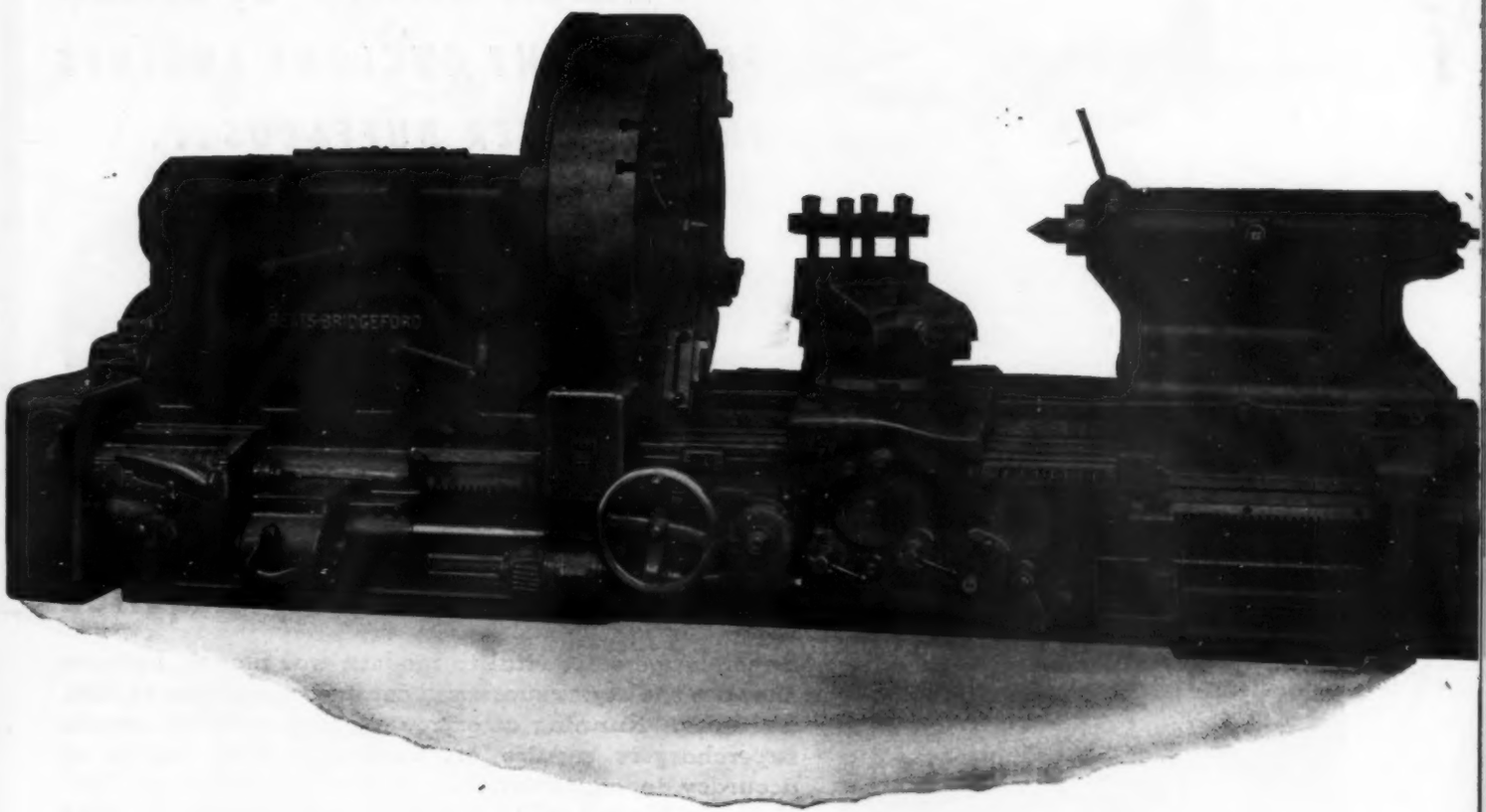
J-90454

IF **THE EQUIPMENT NEEDING MAINTENANCE OR REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE OR WIRE THE NEAREST WESTINGHOUSE "M & R" PLANT FOR**

EMERGENCY SERVICE

33 PLANTS . . . ONE NEAR YOU!

RUGGEDNESS AND STAMINA TO MEET TODAY'S REQUIREMENTS



In times like these the stamina and ruggedness of machine tools are really tried and true value and true work show up. And it is in times like these that Betts-Bridgeford Lathes with their extra measure of strength and their capacity for handling tough jobs are truly appreciated.

Where important turning and boring jobs are being done, you will find sturdy, willing Betts-Bridgeford Turning and Boring Lathes. Hour after hour and day after day with no let up, you can see Betts-Bridgeford Lathes turning in their usual dependable performance.

Betts-Bridgeford Heavy Duty Lathes, from 26" to 144" swing, may be able to help you in your part of the Victory Program—Ask us!

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

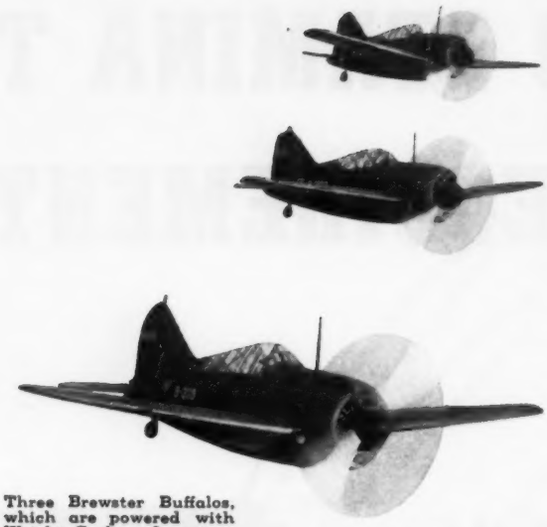
CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER, NEW YORK

BARBER-COLMAN

TYPE "A" HOBBING MACHINES

CUT SUPERCHARGER IMPELLER SHAFT SPLINES

FOR WRIGHT CYCLONE ENGINES IN BREWSTER BUFFALOS...



Three Brewster Buffalos, which are powered with Wright Cyclone 9 engines flying in formation. Photo by Wright Aeronautical Corporation.

High Degree of Accuracy Required

Superchargers are vital to modern war planes, because they are the key to successful combat operations at high altitudes. Running at extremely high rotative speeds, superchargers require an unusually high degree of accuracy in construction. Barber-Colman Type "A" Hobbing Machines have proven their ability to meet these exacting requirements because they are used for hobbing the splines on the impeller shaft shown above. Tolerances require that the surfaces and pitch diameter of the gear and splines must be concentric, parallel, flat, square, and true with each other within a total error of less than .002". This is only one of many ways in which Barber-Colman products are contributing successfully to the war effort.

"EASY TO SET-UP—EASY TO WORK ON"

That is what experienced hobbing machine operators say about the Barber-Colman Type "A" Hobbing Machine. We have been building hobbing machines for over 30 years, and in that time have learned what it takes to make a machine that is accurate, rugged, and easy to handle. As a result of this experience many improvements and refinements have been made in the Type "A". To get full details, write for our Bulletin F 1099-3.

PRODUCTION DATA

Part — Supercharger Impeller Drive Shaft. Material, AMS6250, Rockwell C 32-40. Spline section, 49 splines, 3.26" long, 2.083" O.D., special 24 pitch, 30° stub form.

Set-up — Hobbed in one cut, with feed of .025" per revolution of work, hob speed 139 r.p.m. Hob 2½" x 2½" x 1¼" hole.

Production — Approx. 1 hour per piece, per machine. Three Barber-Colman Type "A" Hobbing Machines used, with one operator handling all 3 machines.

BARBER B-C COLMAN PRODUCTS

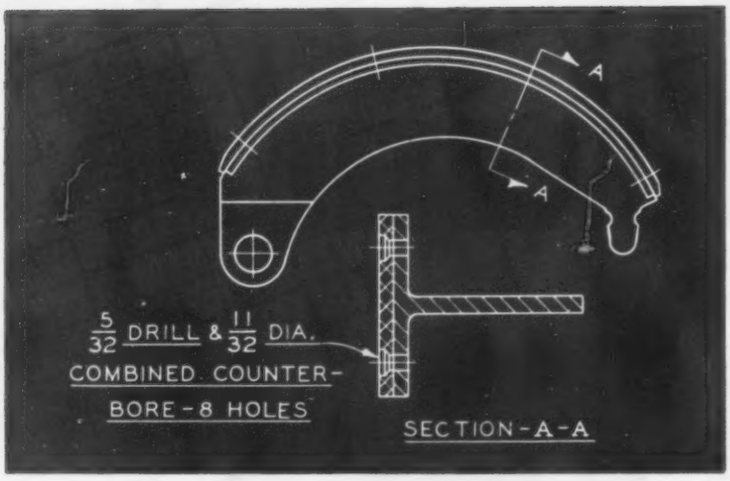
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant 201 Loomis Street, Rockford, Illinois, U. S. A.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

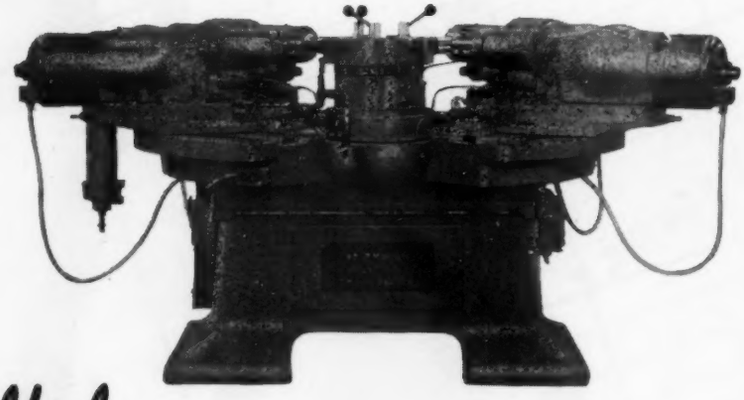


THIS IS A

FLEXIMATIC

AUTOMOTIVE JOB!

Brake Shoe and Lining Production Speedily and Accurately Handled



FLEXIMATIC

by KINGSBURY

One important advantage of the FLEXIMATIC is the fact that it is a machine providing automatic indexing for performing various machining operations in a single chucking of the work.

This method is specifically applied to the Model GD Eight-Spindle Fleximatic arranged for drilling and counterboring brake shoes and linings shown in the accompanying drawing. Many variations of the machine are available, some for linings only and others for shoes only.

The FLEXIMATIC system, pioneered by Kingsbury, involves a single base on which is mounted an indexing turret and standard metal cutting units for each operation such as drilling, reaming, counterboring, etc. The turret is designed to receive a number of duplicate work holding fixtures and can be rotated intermittently under control of the operator for presenting fixtures to loading and working stations. While units are in action, the turret is locked securely. All automatic operations are performed simultaneously while the operator removes a finished part and replaces it with a rough part at the loading station.

Speed, accuracy and easy handling even by unskilled operators are inherent in the performance of FLEXIMATICS.

Write today for illustrated Bulletin showing a number of different set-ups

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U.S.A.

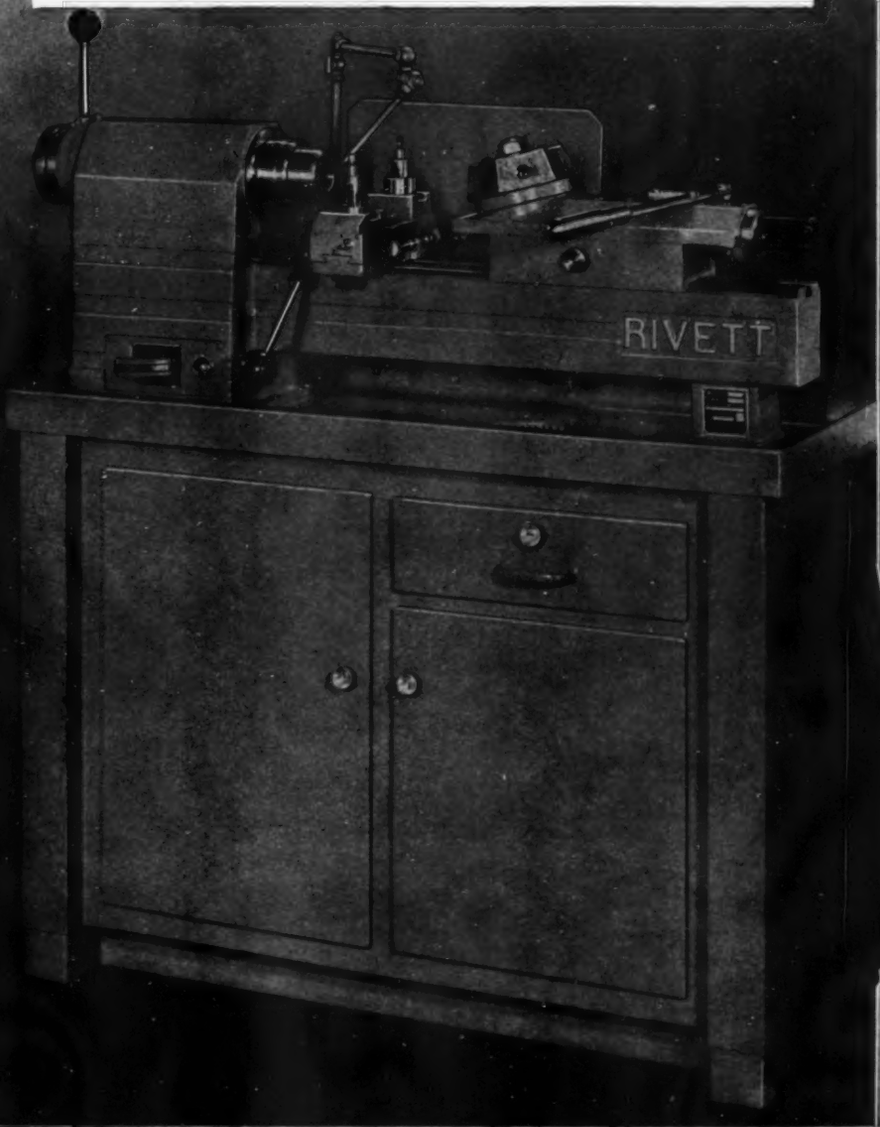
RIVETT

918 HAND SCREW MACHINE

For Bar or Individually Chucked Work Requiring up to Eight Successive Operations

The Rivett No. 918 Hand Screw Machine assembly consists of box sectioned bed, enclosed ball bearing headstock, rotary chuck closer, double tool slide and six station turret. Other combinations are available, using chasing bar for internal or external threading, illustrated on page 4, or compound slide rest with turret tool post. Steel cabinet mounting has [illegible] and sump for cutting oil. Bench mounting is optional.

The ball bearing spindle has [illegible] taper key-drive nose for mounting and driving jaw chucks or [illegible]. Draw-in or push-out collets, as specified, are operated by [illegible]ve acting rotary chuck closer. Double tool slide may be set up with any combination of turning slide and fixed tool holder [illegible] limited in inserts at right. Self-locking three turret head operates on anti-friction bearings and automatically indexes with slide movement or, when released by pull-out stop, may be hand-indexed to right or left without operating slide. Feed of each turret station is controlled by automatic stop.



Straight and Taper Turning Slides

Straight Turning Slide and Fixed Block

Cutting-Off and Forming Blocks

SPECIFICATIONS

Swing over bed, dia.	9"
Distance between spindle mouth and face of turret	
With draw-in collet	14½"
With push-out collet	13½"
Collet capacity:	
Draw-in type, max. dia.	1"
Push-out type, max. dia.	1"
Step chuck capacity, max. dia.	6"
Jaw chuck capacity, max. dia.	6"
Spindle capacity, max. dia.	1⅛"
Travel of turret slide, max.	4½"
Number of tool holes in turret	6
Dia. and depth of tool holes	¾" x 1"
Swing over double tool slide	4½"
Cross travel of double tool slide	3"
Travel of straight turning slide	2¼"
Travel of taper turning slide	2¼"
Spindle speeds, eight forward and reverse:	
Low range	150 to 2500 r.p.m.
High range	225 to 3750 r.p.m.
Weight of hand screw machine, mounting and drive, net 900 lbs.	

918 HAND SCREW MCH.

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT

IF THERE is one thing in which the Faith of all Americans is fully justified it is in the ability of American Industry to produce. From the very beginning of the War Emergency we have all expected production on a truly American basis and this is in itself something to ponder. But the actual performance of American Industry with its dander up and its Patriotism aroused exceeds the wildest dreams of our greatest optimists and puts to shame the few who knew it couldn't be done and why.

We are proud of the engines and guns and machines our men have contributed to this miracle. We are proud to have taken an active part in an undertaking so inspiring. And when the war is over and won we shall be proud to participate in the inevitable sequel to the Production Miracle of 1942.

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

FOSDICK

JIG BORER *speeds vital* WAR *production*

● The need for speeding up production of war material for our forces on the many fighting fronts grows daily.

The Fosdick Jig Borer has the rigidity to stand up month after month on 24-hour production and versatility that permits quick change over from one job to another.

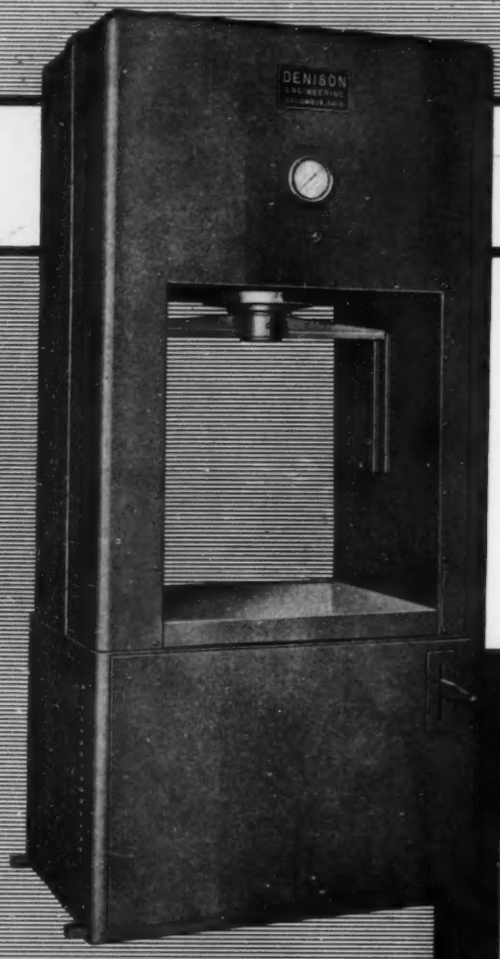
In hundreds of tool and die shops throughout the nation Fosdick Jig Borers are proving their stamina and productive capacity on vital war work.

This dependable construction plus centralization of control are helping operators turn out accurate work on high production schedules.

Here is a moderately priced machine not requiring highly skilled labor that will bear investigation both from the standpoint of production and costs.

Write for Bulletin J.B.A. for details.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI ··· OHIO

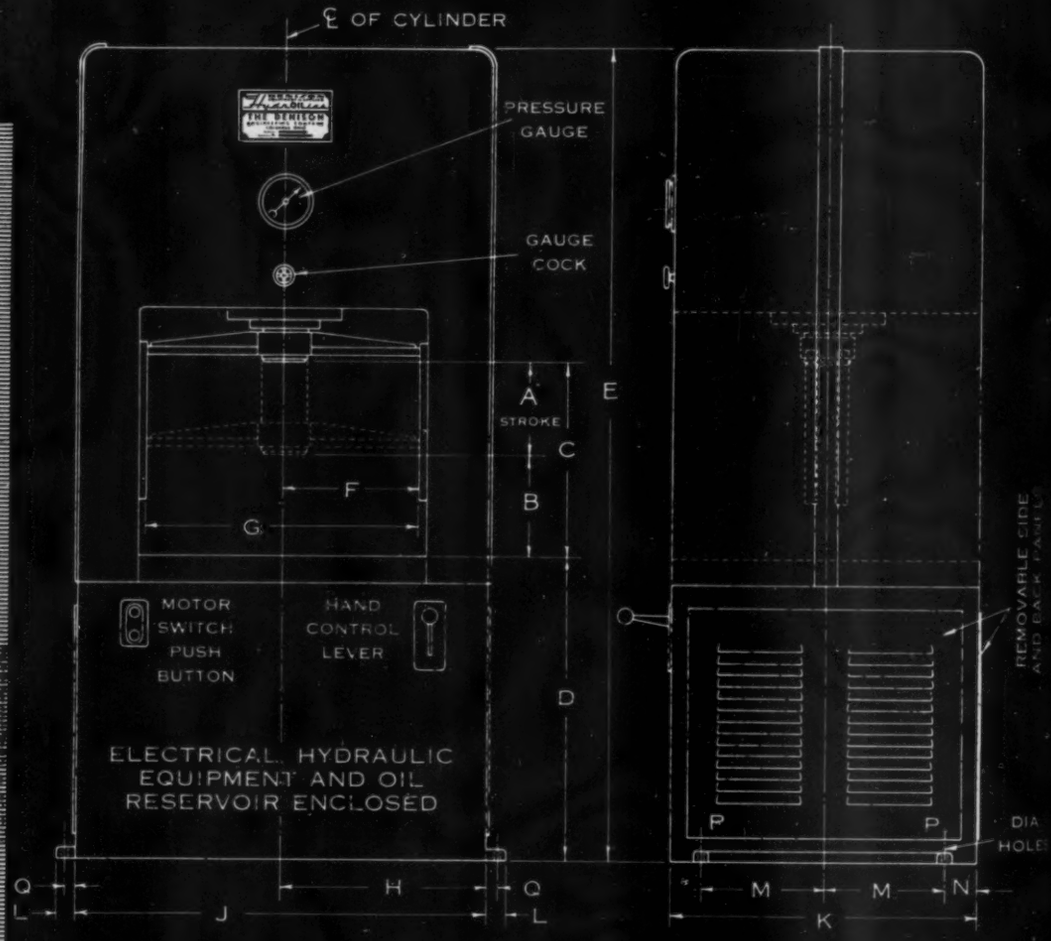


VERSATILE 50-TON

Equally Efficient On Small-lot and Production-line Assembling, Bending and Straightening

DLOS2-50

WHEREVER YOU NEED POWER, SPEED, CONTROL *Check*



DENISON EQUIPMENT *in* APPLIED Hydrolics

TRADE-MARK

N OPEN-SIDE HydrOILic PRESS

The versatility of this Denison HydrOILic Press makes it quickly adaptable for an extremely wide range of operations — with equal efficiency on either small-lot or production-line work. The flexibility of its smooth, oil hydraulic operation gives you variable tonnage control in a stepless range of from approximately 5 tons up to the full 50-ton capacity. All operating mechanism is completely enclosed in the streamlined, safety-cornered frame—a feature that promotes safety for the operator. Like other Denison HydrOILic presses, the DLOS2-50 stands up under long, hard use with minimum maintenance. All principal moving parts operate in a bath of oil. You'll find you can get more effective POWER, SPEED and CONTROL for many pressing jobs in your plant with this modern press. Available with either manual or electric controls, or both. Write for further information today, or call your Denison representative.

DLOS2-50

		K	40
A	18	L	2 1/2
B	18	M	16
C	36	N	4
D	39	P	1 1/16
E	116	Q	1 1/2
F	18	W	10000
G	36	X	10100
H	27	Y	10250
J	54	Z	330

SPECIFICATIONS

	DLOS2
MAXIMUM WORKING CAPACITY, TONS	50
CYLINDER BORE, INCHES	8
RAM SPEED, DOWN (RAPID TRAVERSE) F.P.M.	12
RAM SPEED, DOWN (HIGH PRESSURE) F.P.M.	1.2
RAM SPEED, UP F.P.M.	27
PUMP VOLUME, GALLONS PER MIN.	29/2.5
MAXIMUM WORKING PRESSURE, P.S.I.	2000
MOTOR H.P. 1200 R.P.M.	7.5
RAM DIAMETER, INCHES	6
RAM THREAD, FEMALE, SIZE, PITCH	2 8P
OIL RESERVOIR CAPACITY, GALS.	60

OPERATION

When the ram is at the limit of the upstroke the directional control valve is automatically and positively held in neutral position, preventing movement of the ram, while the pump and its motor idle. With pump and motor idling, minimum power is consumed. Downward movement of the control lever causes the ram to move downward at rapid traverse speed, exerting minimum tonnage until it contacts the work. Further downward movement of the control lever increases tonnage applied to the work. If the control lever is released, the ram moves upward until the upper stroke "stop" is reached, and the control valve automatically brought to neutral.

Priorities still have first call on HydrOILic Press output. But since conditions may change rapidly, we suggest you submit your requirements to us without delay. We'll tell you promptly the delivery we can make in your particular case.

A BULLETIN YOU'LL WANT

Gives latest specifications on Denison's line of HydrOILic Presses, known for high accuracy of POWER, SPEED AND CONTROL for a wide range of operations—assembling, straightening, bending and others! Also contains valuable engineering data. Write at once for your free copy of Bulletin 109.

DLOS2-50 OPEN-SIDE PRESS

CAPACITY: 50-TONS

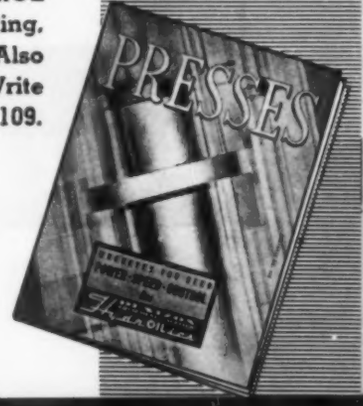
MANUAL OR ELECTRIC CONTROLS

MAX. WORKING PRESSURE: 2,000 p.s.i.

MAXIMUM STROKE: 18"

MAX. THROAT OPENING: 16"

MAX. VERTICAL OPENING: 36"



The **DENISON ENGINEERING COMPANY**

1164 DUBLIN ROAD **COLUMBUS, OHIO**

Horton chucks

INDEPENDENT Solid Reversible Jaws Only

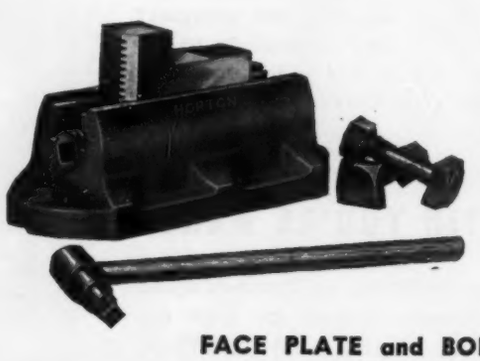
SCROLL UNIVERSAL Two-Piece Jaws Only

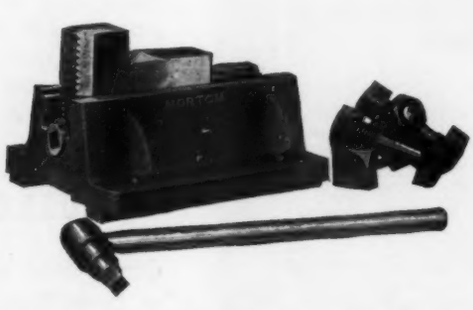
For Use With Intermediate Plates On Threaded Spindles

For Key Drive Tapered Nose Spindles

War Production
Limited To These
Essential Chucks

For Flanged Tapered Nose Spindles
Illustration shows chuck for Type D (Cam Lock) Spindle





HORTON
MORROW

FACE PLATE and BORING MILL JAWS—Steel Body Only

SINCE 1851 .... THE E. HORTON & SON CO.
WINDSOR LOCKS, CONNECTICUT, U. S. A.

REID GRINDERS . . .

"Commandos Behind the Line"

• Ability to supply Commandos with arms and ammunition "over there" rests in large measure with the speed, productivity and accuracy of machines "back here"—on the performance, for example, of such "Commandos in the Shop" as Reid Surface Grinders.

These machines have the ability to "take it" as well as "give it"—to wipe out previous conceptions of high production and set up new records to shoot at—to stand up to long-hour service like the veterans they are—to deliver the goods on time and in accordance with the strictest orders for accuracy.

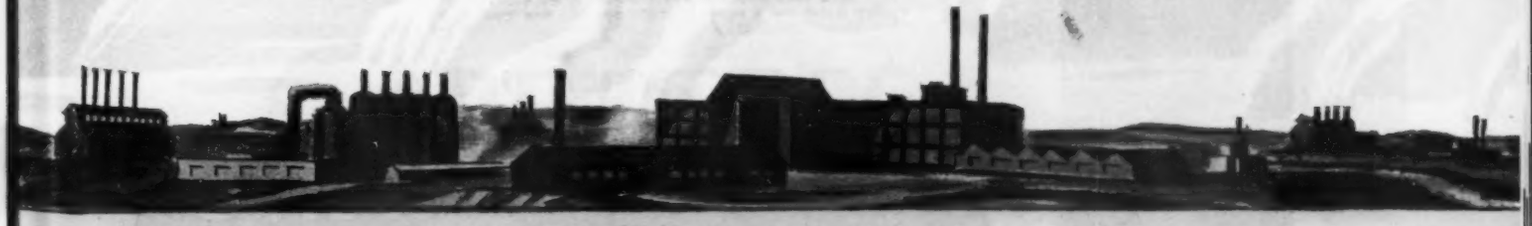
"Every inch a Commando" is a simple, realistic way to describe Reid Surface Grinders. Look over their specifications, condensed here for quick reference. Write for further details.

SPECIFICATIONS

Model 2-C, Hand-Feed—Work capacity up to 6x18x14"; table size 51x8"; spindle speed 3500 R.P.M.

Model 2-B, Automatic Feed—Work capacity 6x18x14"; table size 51x8"; spindle speed 3500 R.P.M.

Model 2-A, Automatic Feed—Work capacity 6x18x11½"; table size 46x8"; spindle speed 3200 R.P.M.

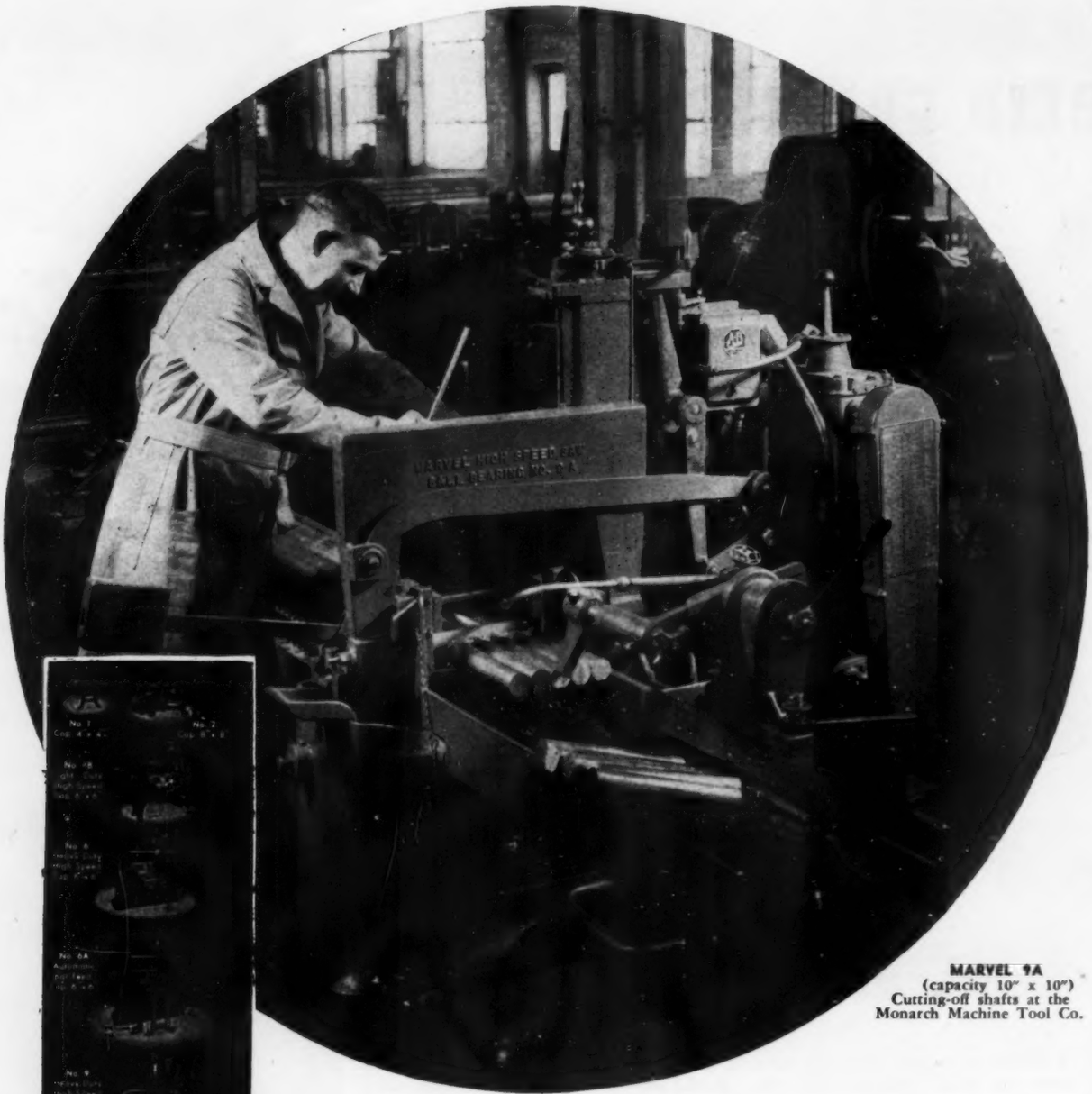


H. LEACH MACHINERY CO.

367 CHARLES ST., PROVIDENCE, R. I.

Sole Agents

DISTRIBUTORS IN KEY CITIES



MARVEL 9A
(capacity 10″ x 10″)
Cutting-off shafts at the
Monarch Machine Tool Co.

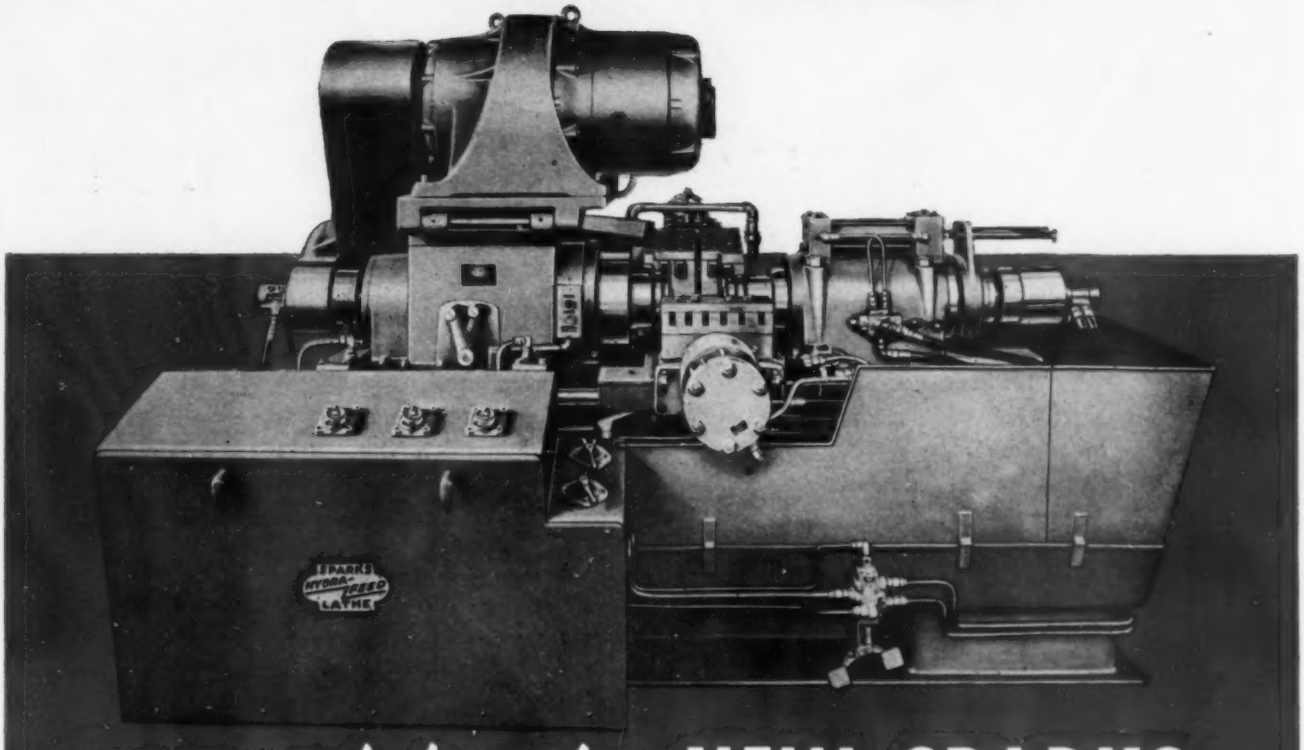
Fine Machine Tool Builders Know their Machine Tools!

- When the Monarch Machine Tool Co., builders of Monarch Precision Lathes, needed another cutting-off machine, they chose a MARVEL 9A Production Saw . . . one of MARVELS new heavy-duty, all-ball-bearing sawing machines with automatic bar push up. These are the fastest saws built—will cut-off more pieces, floor-to-floor, from single or nested bars than can be cut-off by any other method.

ARMSTRONG-BLUM MANUFACTURING CO.
"The Hack Saw People"
5700 Bloomingdale Ave., Chicago, U. S. A.
Eastern Warehouse & Sales: 225 LaFayette St., New York, N. Y.

MARVEL SAWS

FAST TURNING . . . . OF HEAVY AIRPLANE CYLINDERS



assured by the NEW SPARKS
SEMI-AUTOMATIC MULTI-TOOL CYLINDER LATHE

Designed and built especially for speed, accuracy and convenience in airplane production, this new SPARKS LATHE can be depended on to meet every requirement of heavy duty turning. Many features new to cylinder turning are incorporated in this machine. For example, six turning tools are employed on the front cross slide for turning the main body using a cartridge tool holder mounted on cross slide and operated hydraulically. Back slide is equipped with back tool holders with six tools which also move in and out of work automatically.

Other features include:

. . . holding mandrel especially designed for gripping cylinder at both ends.

. . . roller bearing quill arbor, expanded automatically by operation of separate hydraulic cylinder attached to end of quill; quill actuated for backward and forward traverse by hydraulic cylinder.

. . . all feeds automatically controlled through metering valves on front of lathe convenient to operator.

. . . holding equipment, foot treadle operated, allows for quick recovering of finish turned cylinder and rapid gripping of a new rough cylinder to be turned.

. . . headstock fitted with ball and roller bearings; four selective speeds for all sizes of cylinders.

. . . motor equipped with reducing gears to permit slow speeds for turning hard cylinder materials.

Write today for Descriptive Bulletin

Investigate the possibilities of this new lathe on your work.

SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION
NORWALK CONN

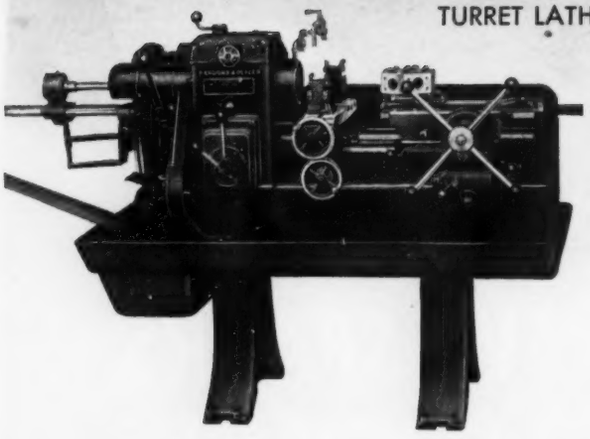
Bardons AND Oliver

NO. 2 GEARED ELECTRIC TURRET LATHE

for Ease of Operation . .

On production of small parts, whether from bar, forging, or casting, THE EASE OF OPERATING the turret lathe is of paramount importance. This is truer today than ever before as more and more women are finding their places in industry.

Here are a few of the features that make the No. 2 GEARED ELECTRIC TURRET LATHE outstanding in its field:



Single lever electric start—stop—reverse in combination with single lever electric high-low speed change.

Single lever control with direct reading dial for six geared spindle speed changes.

Direct reading six feed change dial with single lever control.

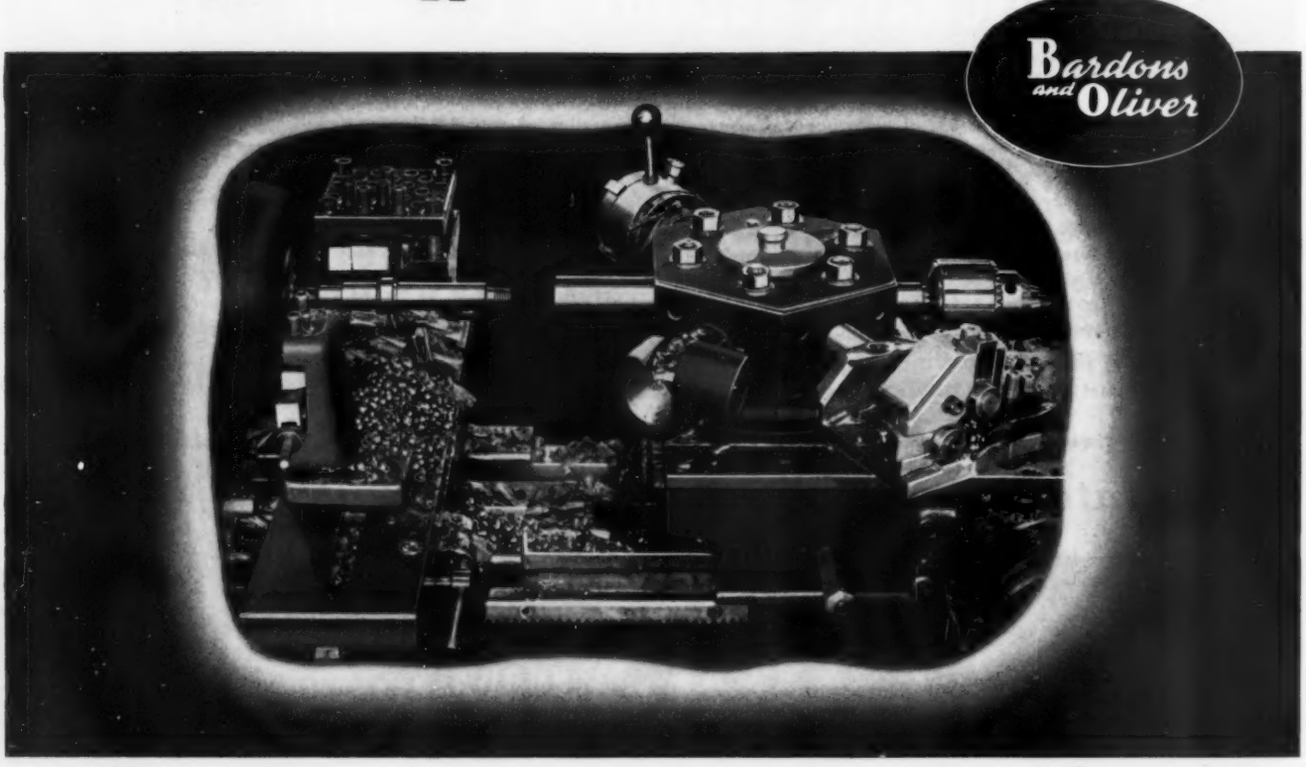
Automatic turret clamp with automatic wear compensator.

Tool carrying slides and controls responsive to light sensitive touch.

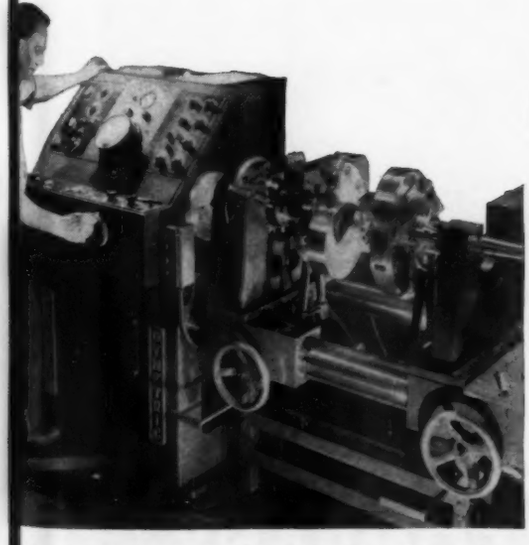
So, if you are interested in EASE OF OPERATION, let us give you further information.

BARDONS & OLIVER, INC.

1153 W. 9TH ST. . . CLEVELAND, OHIO



Picture of an impulse in motion



Balancing an airplane crankshaft with a Gisholt Dynetric. So sensitive and accurate is this machine, it will pick up unbalance vibrations as small as .000025".

Webster says an impulse is "a force so communicated to produce motion suddenly."

Some impulses are properly harnessed, others go astray—to start trouble. In rotating machinery, the impulses caused by static or dynamic unbalance travel from one part to another—carrying vibration, excessive wear, loss of efficiency, short life.

Detecting these harmful impulses before they do damage is the job of Gisholt Dynetric Balancing Machines. Accurately locating and measuring unbalanced forces by the radio means of amplification takes but a few seconds with these new and greatly simplified machines.

GISHOLT MACHINE COMPANY
1201 E. Washington Ave., Madison, Wis.

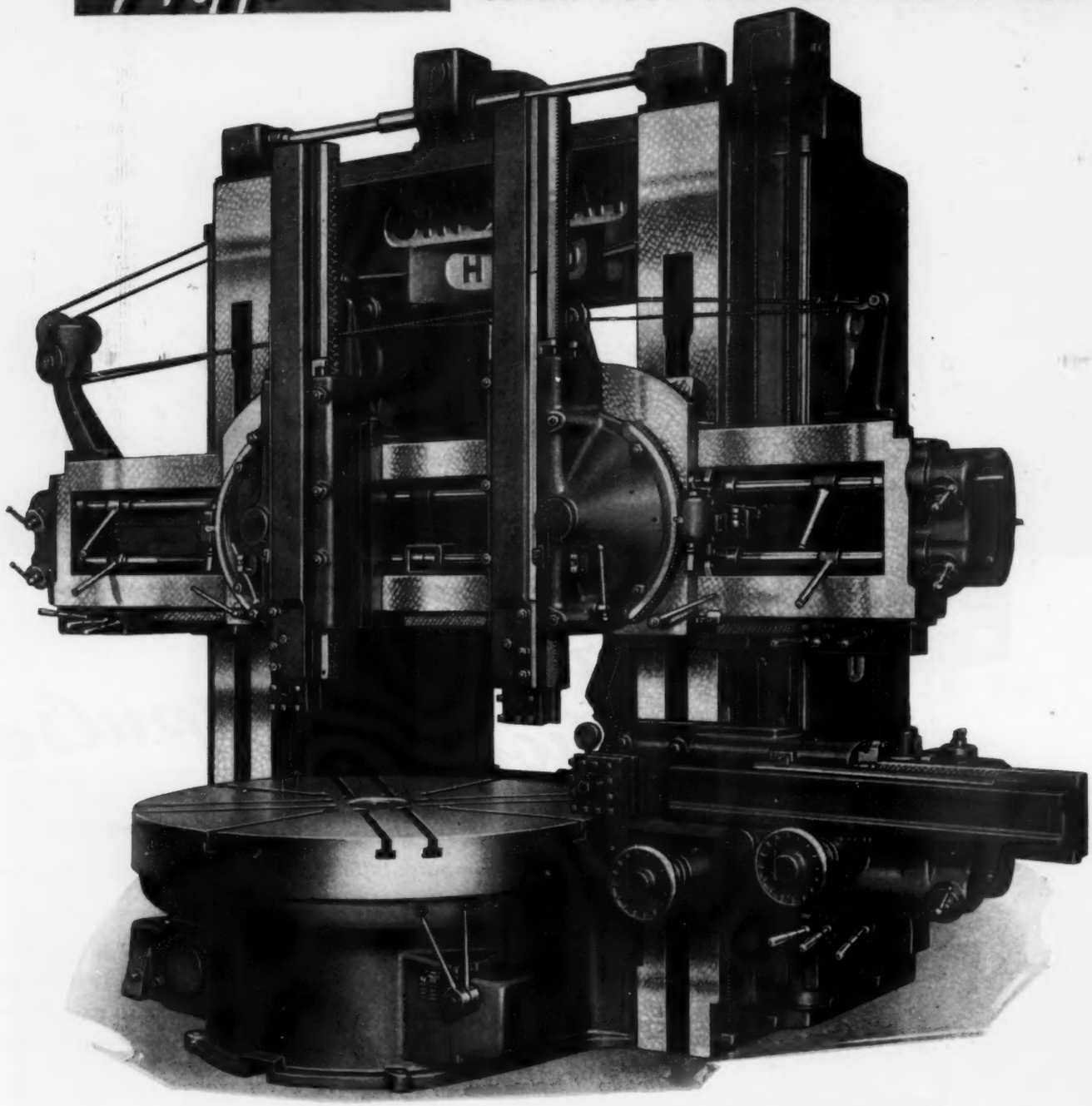
GISHOLT

LOOK AHEAD . . . KEEP AHEAD . . . WITH GISHOLT IMPROVEMENTS

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

CINCINNATI Hypro

SEVEN FOOT VERTICAL BORING MILL



Through a unique design of support, the side head saddle on the outside of the massive housing permits distribution of all stresses from heavy cuts over the entire housing. ***Write for Bulletin 125A.***

THE CINCINNATI PLANER COMPANY

Planers... Vertical Boring Mills... Planer Type Millers

CINCINNATI . OHIO . U.S.A.

AUTOMATIC CHUCKING EQUIPMENT

. . . Steps up Defense Production

PHOTO BY U. S. ARMY SIGNAL CORPS

Proved and demonstrated for fast production and accuracy on parts for peace-time needs, POTTER & JOHNSTON equipment was ready for the urgent needs of Defense industries.

For example, P&J machines are contributing to the realization of unprecedented output of airplanes, aircraft engines, tanks, Bofors guns, anti-aircraft guns, machine guns, adaptors for shells and the American-made Oerlikon gun.

Potter & Johnston is utilizing every facility to help speed the war effort. We are indeed happy to be able to place our many years experience in the development of automatic chucking equipment at the disposal of our armed forces through the metal working industry.

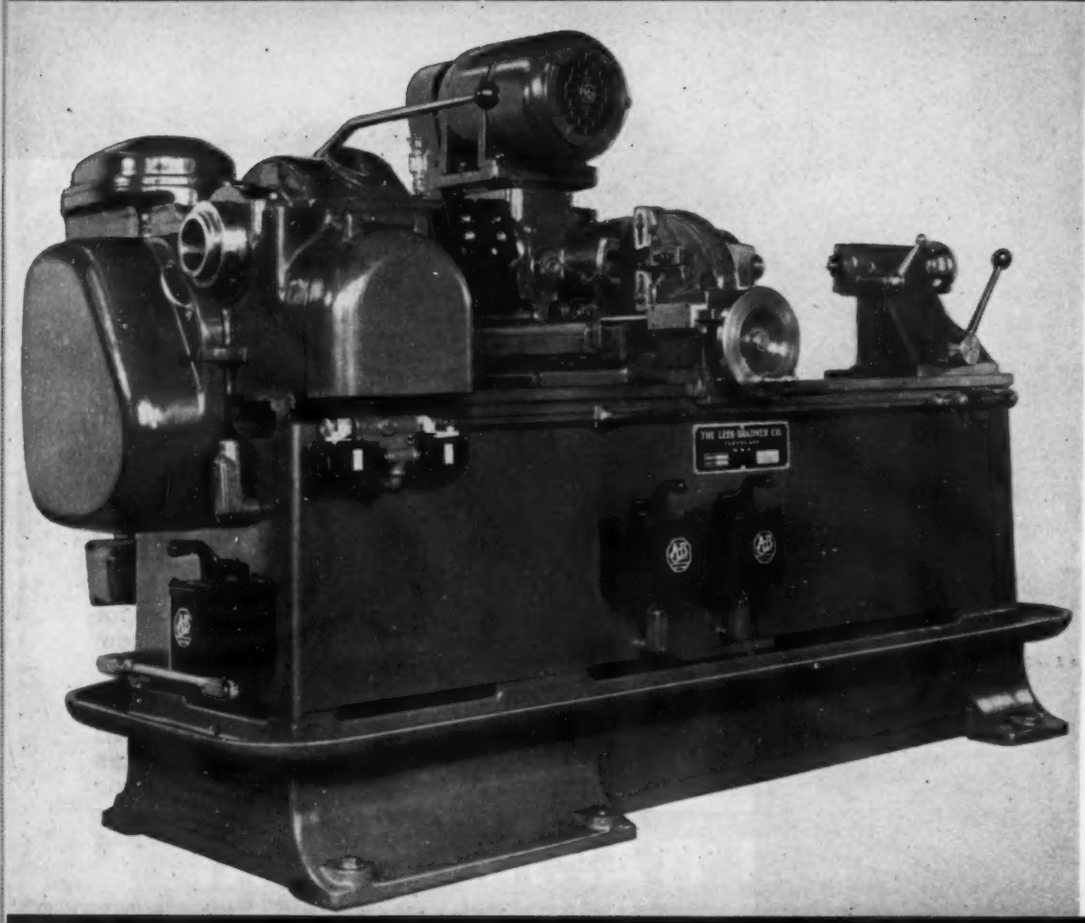
The POTTER & JOHNSTON MACHINE CO.

PAWTUCKET . . . . . RHODE ISLAND

For Jobs Like This -

LEES-BRADNER

Model LT *Thread Miller*



● To obtain the extreme precision demanded in lead and cross feed screws present a problem readily solved by the Thread Miller process.

On work similar to that illustrated, climb milling hobbing machine lead screws, precision is obtained on a production basis with a Lees-Bradner Model LT Thread Miller.

Available in several length capacities up to 132″ between centers.

Why not investigate this modern method of threading for fulfilling your precision requirements? Our Engineering facilities are at your disposal.

The **LEES-BRADNER** *Company*

CLEVELAND, OHIO, U.S.A.

YOU ANSWER "YES" TO ANY ONE OF THE FIRST 6 QUESTIONS

and We'll Answer Question No. 7 Ourselves

Is your honing problem:

1. GENERATING TOO MUCH HEAT AND DISTORTING THE WORK?
2. TOO SLOW AND RETARDING VITAL PRODUCTION?
3. CAUSING TOO MANY COSTLY REJECTS?
4. PRODUCING POOR FINISHES?
5. BREAKING AND CHIPPING ON EDGES?
6. WEARING OUT HONES TOO RAPIDLY?
7. CAPABLE OF BEING SATISFACTORILY SOLVED?

Our answer to No. 7 is "Yes" too—a big, emphatic, confident "Yes."

Certainly your honing problem can be solved! There MUST be an answer to it and our engineers—located in all large cities—will be glad to find it for you. All you do is call us in, explain your problem and cease worrying about it. We will do the rest.

Perhaps your stone is not of the proper grain or grade for the metal you are honing or the finish you desire? Perhaps your tool speed is not right? Perhaps your pressure is too great or too little? Perhaps your coolant is not suited to the job? Perhaps your rotational and traverse speeds are not properly synchronized?

Whatever your particular "perhaps" may be, one thing is certain: The MID-WEST ABRASIVE COMPANY can solve it for you. MID-WEST engineers are specialists in the problems of grinding, honing and superfinishing. They have helped many production men turn out better, more dependable products, faster and more economically. Our field engineers are maintained for YOUR CONVENIENCE and OUR MUTUAL BENEFIT. You are cordially invited to call on us for this assistance—anytime.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE DETROIT, MICHIGAN

Mid-West

- ★ *Honing Stones*
- ★ *Superfinishing Stones*
- ★ *Grinding Wheels*
- ★ *Emery Cloth*
- ★ *Sandpaper*

Mid-West Abrasive Company,
1960 E. Milwaukee Avenue,
Detroit, Michigan

Gentlemen: Please send me additional information on Mid-West Micro Bond honing and superfinishing stones.

*Name*_____

*Company*_____

*Address*_____

OHIO PRODUCTION MILLING MACHINES

There are now 14 Ohio Production Milling Machines in this plant. Such repeat orders are no doubt due to the features briefly sketched below.

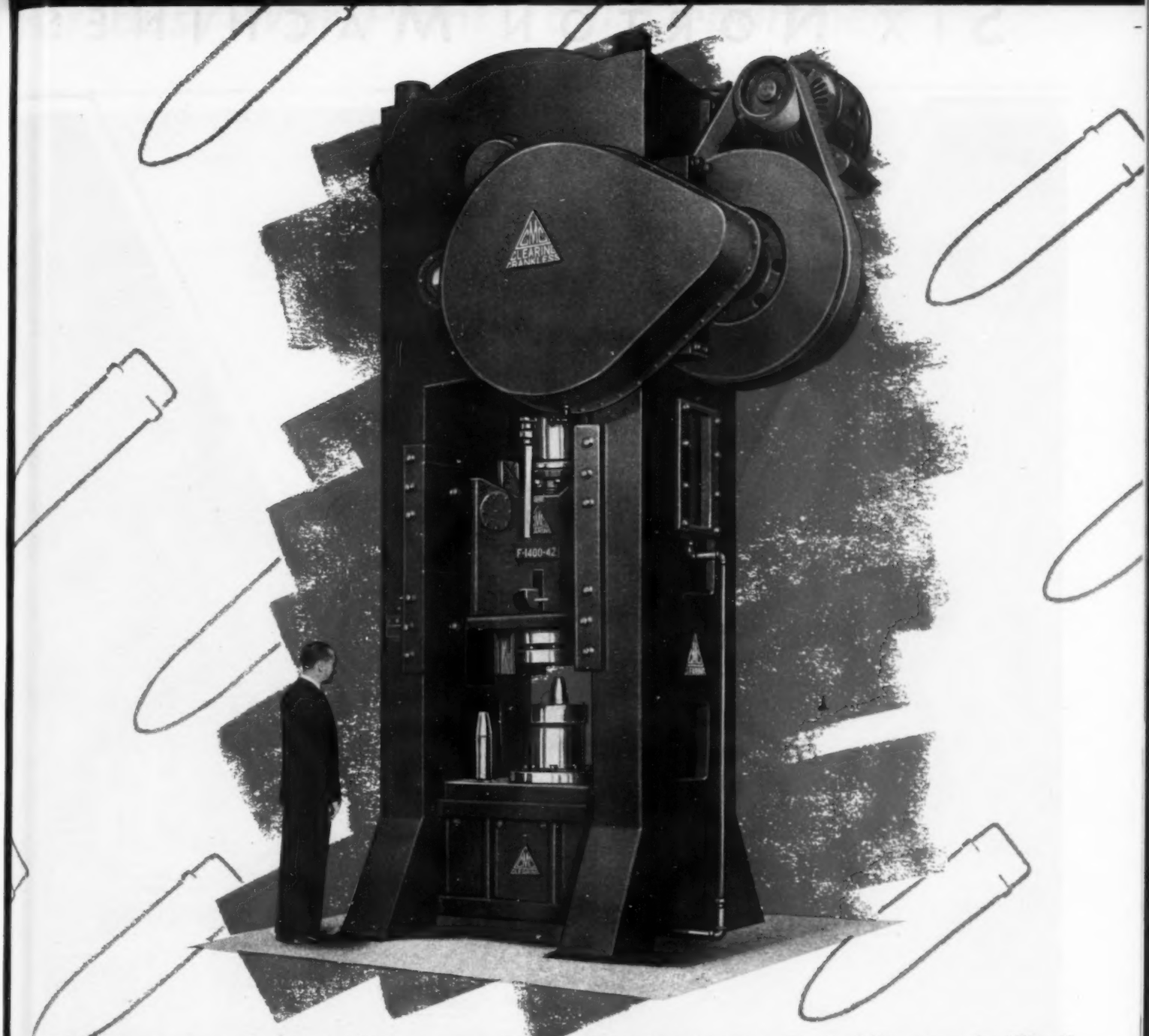
● Its CONVENIENCE and ACCESSIBILITY make the Ohio Production Milling Machine versatile and profitable. On short runs it is easy to set up, operate, get at, and change over. Long runs prove it rugged, accurate, and enduring. The machine mills just as well *against* the feed as with it, thanks to true cutter rotation, a true plane of travel, rigidity, and positive locked feed. You can mill continuously without indexing fixtures. Climb-cutting prolongs service. Available are various cycles of automatic operation of the feed and rapid traverse.

THE OHIO MACHINE TOOL COMPANY • KENTON, O.

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

NOSING THEM OUT FOR VICTORY



This Clearing mechanical 400 ton capacity welded steel press is now performing the nosing operation on 105 m.m. shells at an extremely rapid rate. Requiring exacting workmanship; this job is ably handled by Clearing presses. Begin "Clearing the Way" with a line of Clearing presses.

Clearing mechanical and hydraulic presses. All sizes and capacities.

CLEARING MACHINE CORPORATION
6499 WEST 65th STREET CHICAGO, ILLINOIS

MECHANICAL AND HYDRAULIC PRESSES

CMC CLEARING

CLEARING
MACHINE CORPORATION
CHICAGO

CMC CLEARING

SIX NORTON MACHINES Fo

Why not speed production in your tool room, too — by installing more of the more efficient machines

Inaccurate and dull tools cause a waste of time and effort which has no place in the war program.

Valuable hours of toolmaker's time and additional hours in machining parts for the assembly line can be saved if tool rooms are equipped to make tools efficiently and maintain tools so that they can do their work at top speed all the time.

Norton machines for the tool room are accurate and dependable and help maintain quality tools to keep production at its peak.

Catalogs on any or all of these machines on request—no obligation.

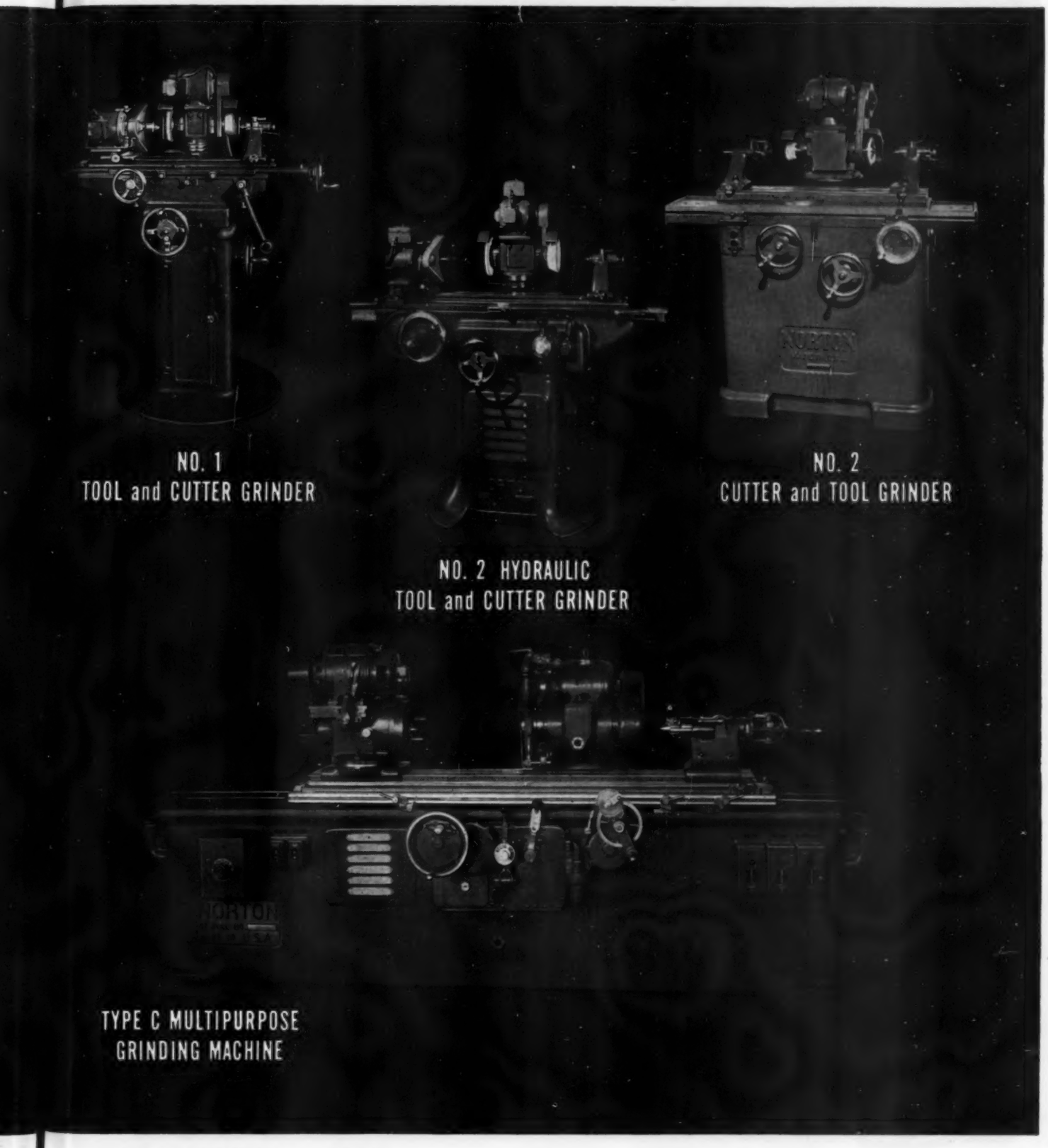
NORTON COMPANY, WORCESTER, MASS.

6"x18" HYDRAULIC SURFACE GRINDER

NORTON MACHINES

NO. 10-U LAPPING MACHINE

S For Busy War Plant Tool Department . . .



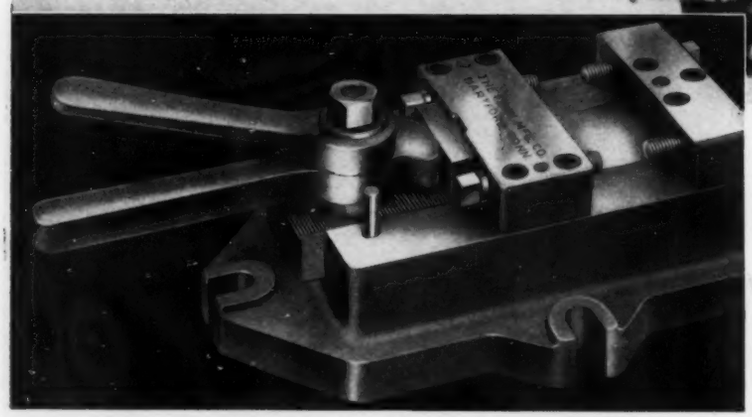
NO. 1
TOOL and CUTTER GRINDER

NO. 2
CUTTER and TOOL GRINDER

NO. 2 HYDRAULIC
TOOL and CUTTER GRINDER

TYPE C MULTIPURPOSE
GRINDING MACHINE

OFFICIAL U. S. NAVY PHOTOGRAPH



Fenn Quick-Action Vises are used in many war production factories for milling, drilling, tapping and assembling.

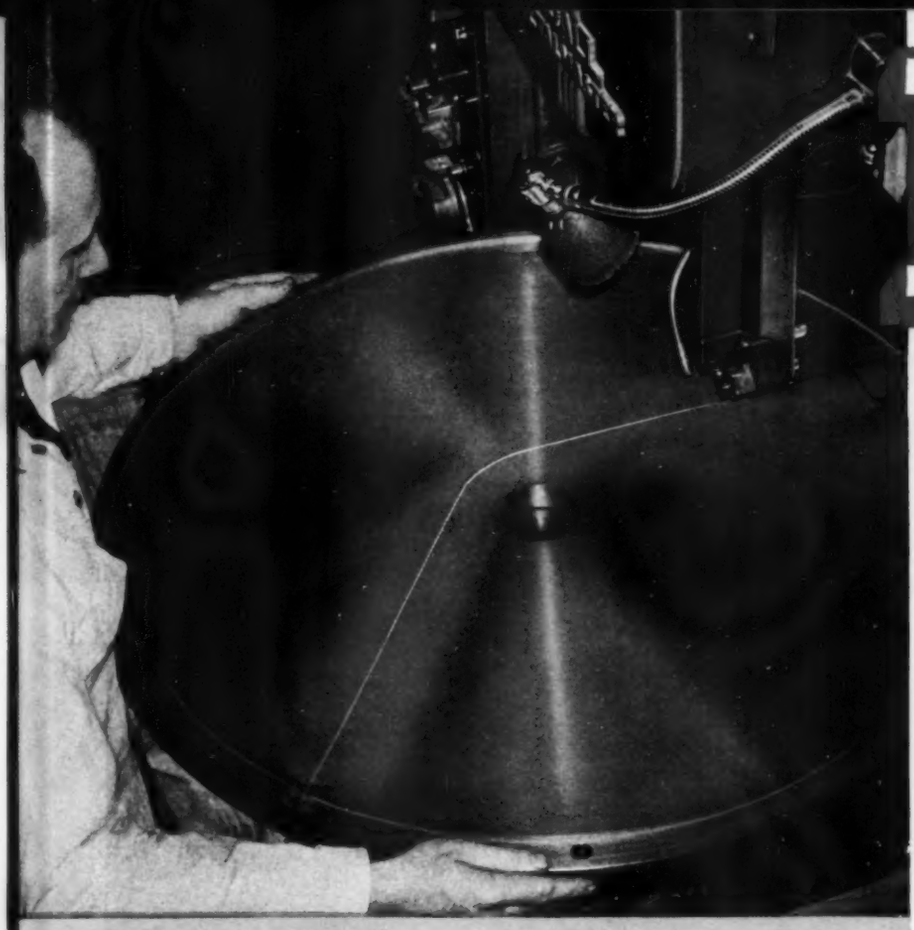
FIRE POWER

Fire power is essential in big guns for battleships. Tremendous gripping power is needed in vises for small parts production. For quick-action and power-grip Fenn Vises have been famous for nearly a half century. Send for Bulletin No. 10.

FENN

THE FENN MANUFACTURING CO.

HARTFORD, CONNECTICUT • ESTABLISHED 1900



DoAll

THE TIME STRETCHER

Left—"Drill Jig for gun mounting cut in 1½ hours by the DoAll. Diameter 35", thickness 1¼". Due to accuracy required, the plate could not be torch cut. The only other way to do the job was to slit it on a miller or part it in a planer. Our DoAll solves problems such as this in one-quarter the time."

MAKES 4 MAN HOURS OUT OF 1

Below—"Special Jig Clamp used to hold a gun sight casting. A 3-dimensional cutting job 3¼" x 3¼" x 6". The usual way is to shape it, requiring at least eight hours. DoAll cuts it in 2 hours."

FOR BUSY PLANTS
THE WORLD'S GREATEST MACHINE TOOL VALUE

- Slices contours through thick sections.
- Fastest precision method of internal and external cutting of any metal or alloy.
- Cuts so clean, further machining is unnecessary.
- Relieves miller, shaper and lathe of hundreds of over-load jobs.
- Eliminates bottlenecks on regular production lines.
- Avoids shut downs of important machines by actually making new replacement parts.
- Makes special tools without dies or molds.
- Saves hundreds of man hours—tons of metal.

WANT TO SEE IT WORK?

A factory trained man will call with a DoAll and show you how this wonder machine will aid in getting your jobs out ahead of schedule.

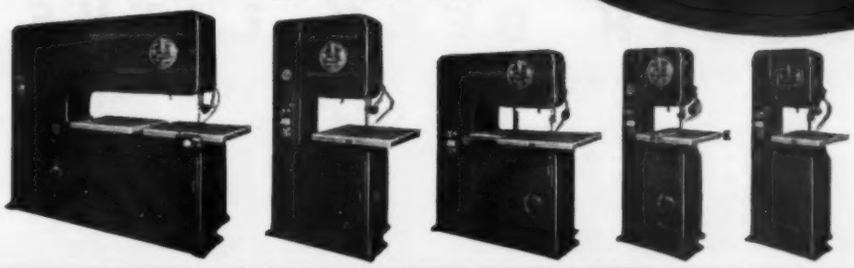
CONTINENTAL MACHINES, INC.

1310 S. Washington Ave., Minneapolis, Minn.

Associated with the DoAll Company, DesPlaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines

EASY READING—"DoAll on Production", an illustrated book you'll want to send for today.

THE EXACT SIZE FOR EVERY DEPARTMENT



1. Under $5000
2. Under $2500
3. Under $2000
4. Under $1500
5. Under $1000

All Models with Motors

HOW TO GET THE MOST OUT OF YOUR LATHES

No. 3 in a series of suggestions made by the South Bend Lathe Works in the interest of more efficient war production

Keep Your Lathes Level

The leveling of a lathe can either perpetuate or destroy the best craftsmanship of the machine tool builder. A lathe that is not kept perfectly level cannot turn out the precision work for which it was built.

The lathe bed is comparable to a toolmaker's surface plate. Upon it rest the headstock, carriage and tailstock. Therefore, any twisting of the lathe bed will throw the headstock, tailstock and carriage out of alignment. This will cause the lathe to turn or bore a taper instead of taking a straight cut. It will also cause the alignment of the tailstock center point to shift as the tailstock is moved along the lathe bed, necessitating constant readjustment of the tailstock top set-over.

Every lathe should be checked periodically to see that it is level

Check Leveling Frequently

The major cause of distortion in lathe beds is the settling of the floor supporting the lathe. This is most commonly encountered in buildings that do not have solid foundations or that have wooden floors or columns. There are numerous other conditions which can cause this, such as the shifting of loads on the floor, swelling of wood flooring, deterioration of wooden shims, and atmospheric changes. For these reasons, every lathe should be checked periodically to see that it is level.

How to Level a Lathe

The first requisite for accurate leveling is a precision level at least 12″ long. One that is sufficiently sensitive to show a distinct movement of the bubble when a .003″ shim is placed under one end of it. A carpenter's level, a combination square level, or an ordinary machinist's level cannot be used because they are not sufficiently sensitive.

The leveling of the lathe is tested by placing the level squarely across the lathe bed, immediately in front of the headstock, and also at the extreme right end of the bed. On lathes having long beds, tests should also be made at one or more intermediate positions. Be sure that the ways are wiped perfectly clean of all chips or dirt before using the level.

Metal shims should be used under the lathe at the points indicated by the level as being low. Some lathes are equipped with leveling screws making it unnecessary to use shims.

After all adjustments have been made, bolt the lathe securely to the floor and repeat the tests to make sure that tightening the leg bolts has not affected the leveling of the lathe.

Alignment Test

A simple alignment test can be used to check the leveling of a lathe. Place a bar of steel, one inch or larger in diameter, in the chuck and machine two collars of equal diameter three or four inches apart. Then, take a very light finishing cut across both collars without changing the setting of the cutter bit. Measure both collars with a micrometer. If the collars are not the same diameter, it is an indication that the lathe is not level. Adjust the leveling until, when a cut is taken, both collars are turned the same diameter.

Write for Bulletin H3

Bulletin H3 giving more detailed information on the installation and leveling of lathes will be supplied on request. Also reprints of this and other* advertisements and bulletins in this series. State quantity.

*Ad. No. 1, "Keep Your Lathe Clean"
Bulletin H1, "Keep Your Lathe Clean"

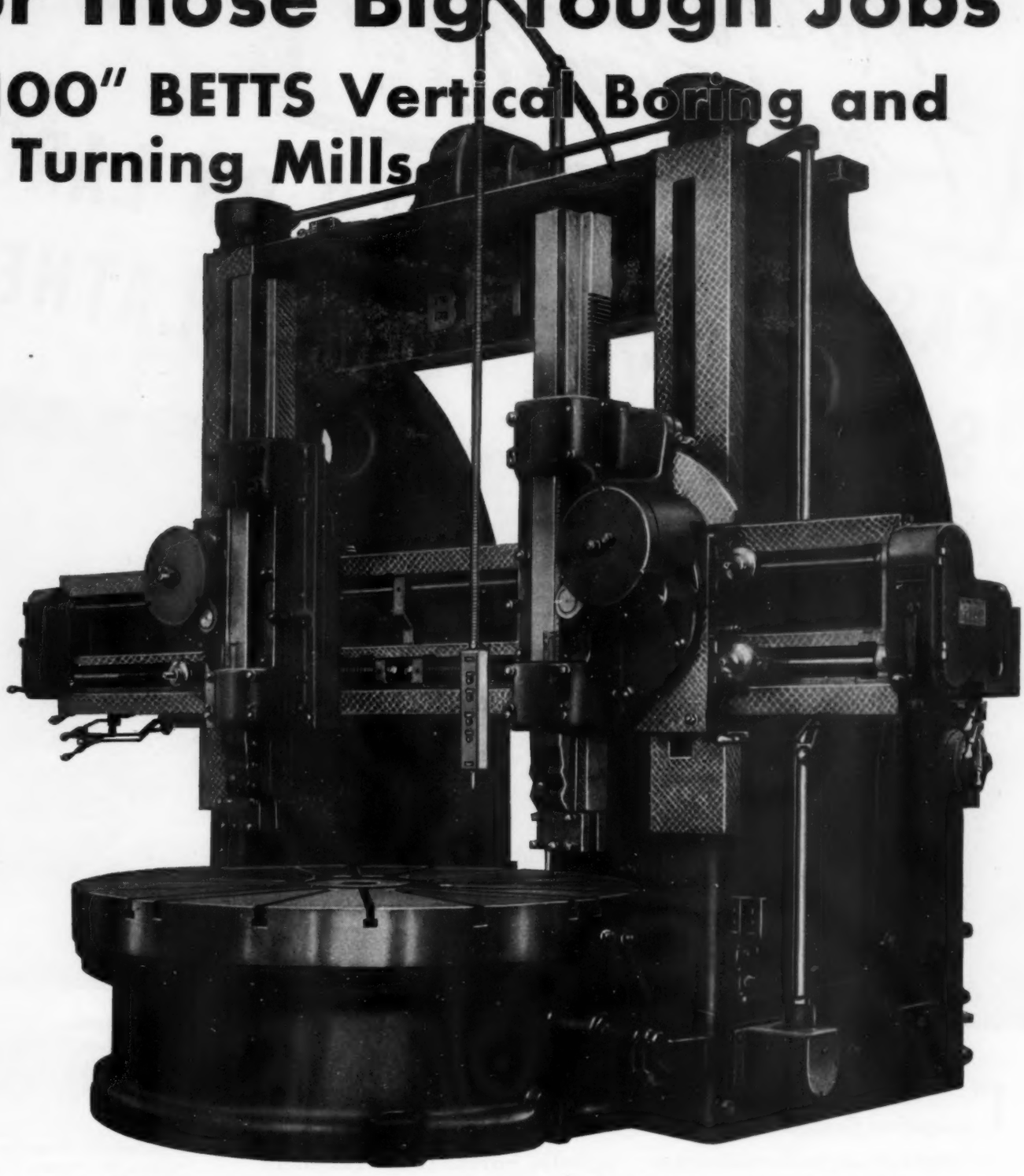
Ad. No. 2, "Oiling the Lathe"
Bulletin H2, "Oiling the Lathe"

SOUTH BEND LATHE WORKS

South Bend, Ind., U. S. A. • **Lathe Builders for 36 Years**

For Those Big Tough Jobs

100" BETTS Vertical Boring and Turning Mills



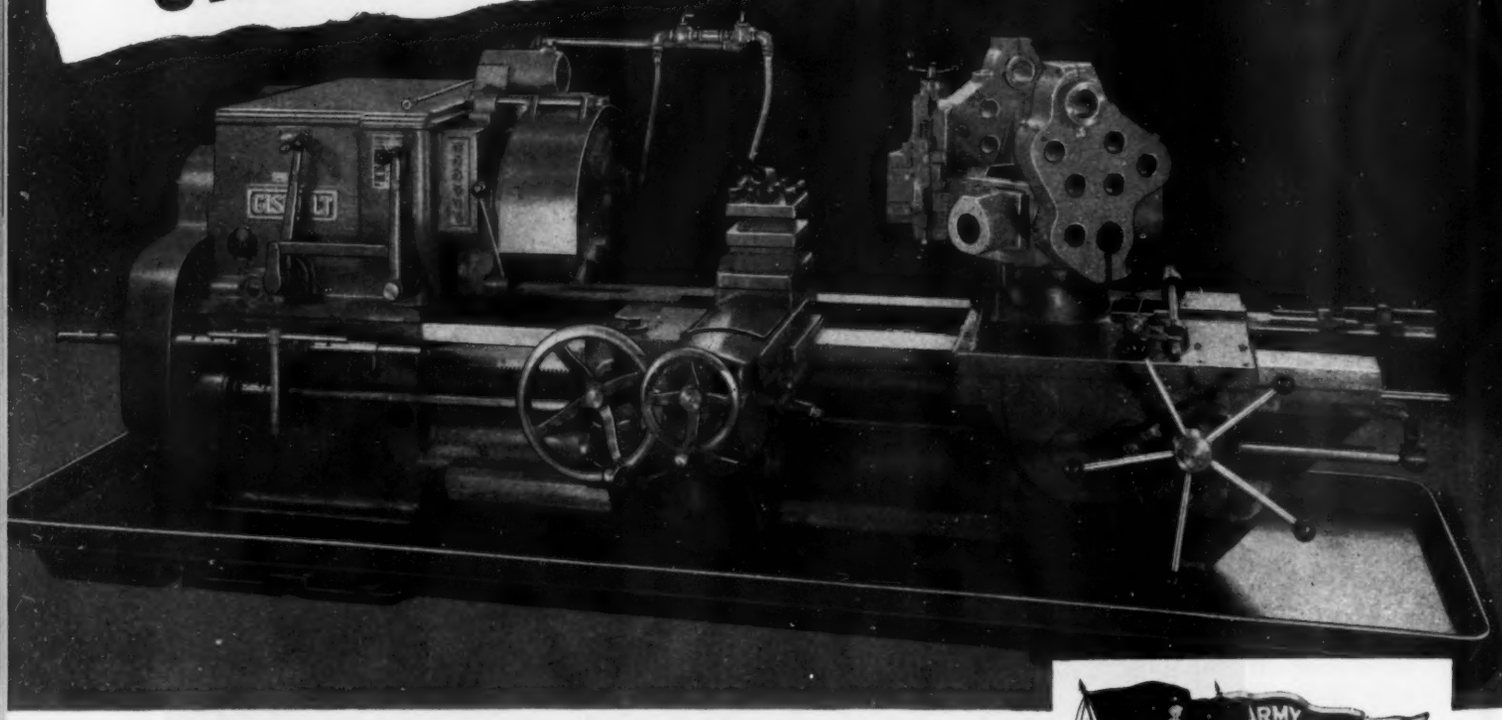
These Mills are designed to handle those Big Tough Jobs, accurately and fast. They are convenient, easy and safe to operate . . . powerfully and rigidly built and will retain their accuracy throughout their long life even under today's pressing schedules. Send for Bulletin No. 2127.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

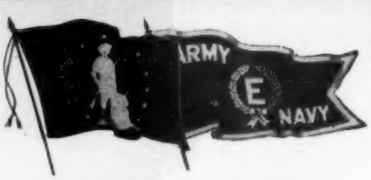
CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER NEW YORK

Note for Production Mgr.!

FASTER DELIVERIES ON LARGE SADDLE-TYPE TURRET LATHES!



IN THE interest of doing first things first, Gisholt has put special emphasis on production of the large saddle-type turret lathes so critically needed for war production. Two sizes are available—with 21″ and 24″ chucks; 5¼″ and 9¼″ spindle bores. If interested in machines of these capacities, you should write us immediately.



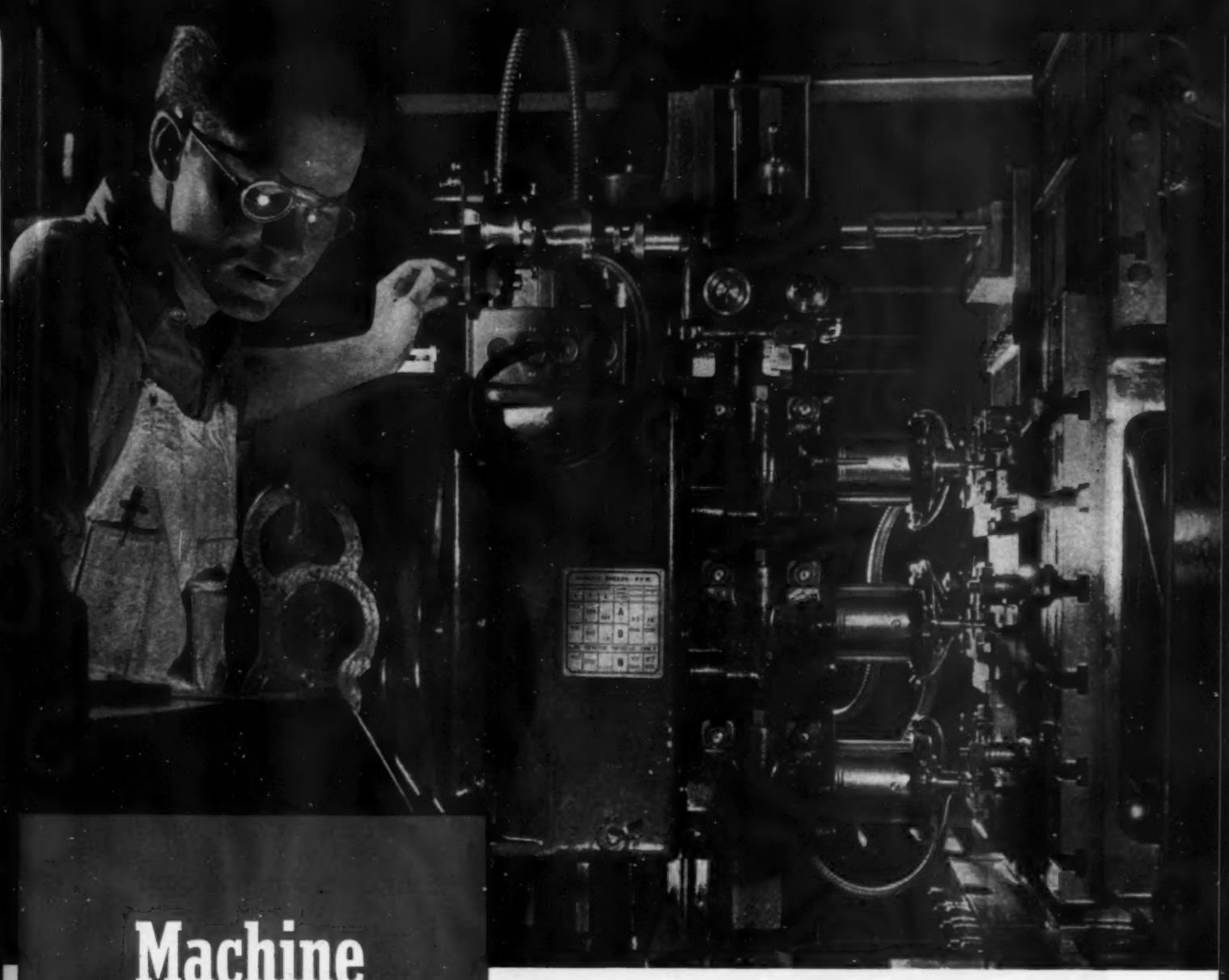
At Gisholt, the Army-Navy "E" and the Treasury Flag fly side by side.

GISHOLT MACHINE COMPANY
1201 East Washington Avenue, Madison, Wisconsin

LOOK AHEAD . . . KEEP AHEAD . . . WITH
GISHOLT IMPROVEMENTS IN METAL TURNING

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES



Machine with a "BRAIN" ... the Keller

RIGHT NOW, this machine is profiling anti-aircraft gun parts, three at a time. *Two years ago* it was working on agricultural implements. *The day after we've won the war* it can turn again to the products of peace . . . *without* conversion, *without* tooling up.

For this is the versatile Keller Machine, one of the many Pratt & Whitney products that provide *basic accuracy for mass production*. It has a mechanical-electrical "brain." Its tracer follows a master pattern . . . its cutters reproduce the pattern in two or three dimensions *precisely*. It maintains its own accuracy, does its own "thinking," demands a minimum of attention. The experience is *built in*.

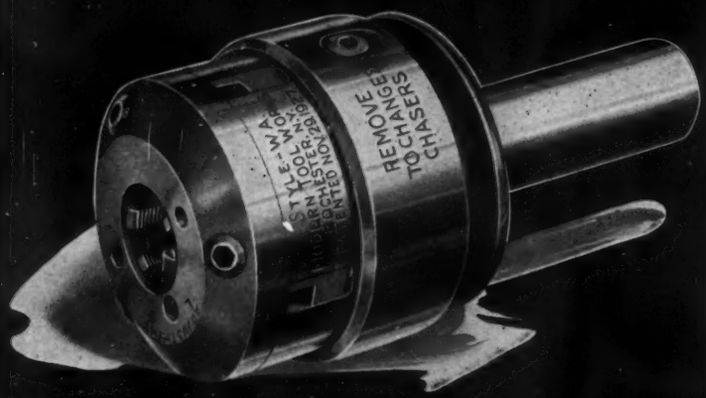
There is no better-paying investment than the right tools for each job. If you need basic accuracy for mass production, call on Pratt & Whitney.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

MODERN ROTARY TYPE SELF-OPENING DIE HEADS



"WA" Die Head—Ring Type, for opening and closing

"WB" Die Head—Trigger Trip Type

FOR *Fast, Accurate and Economical Thread Cutting*

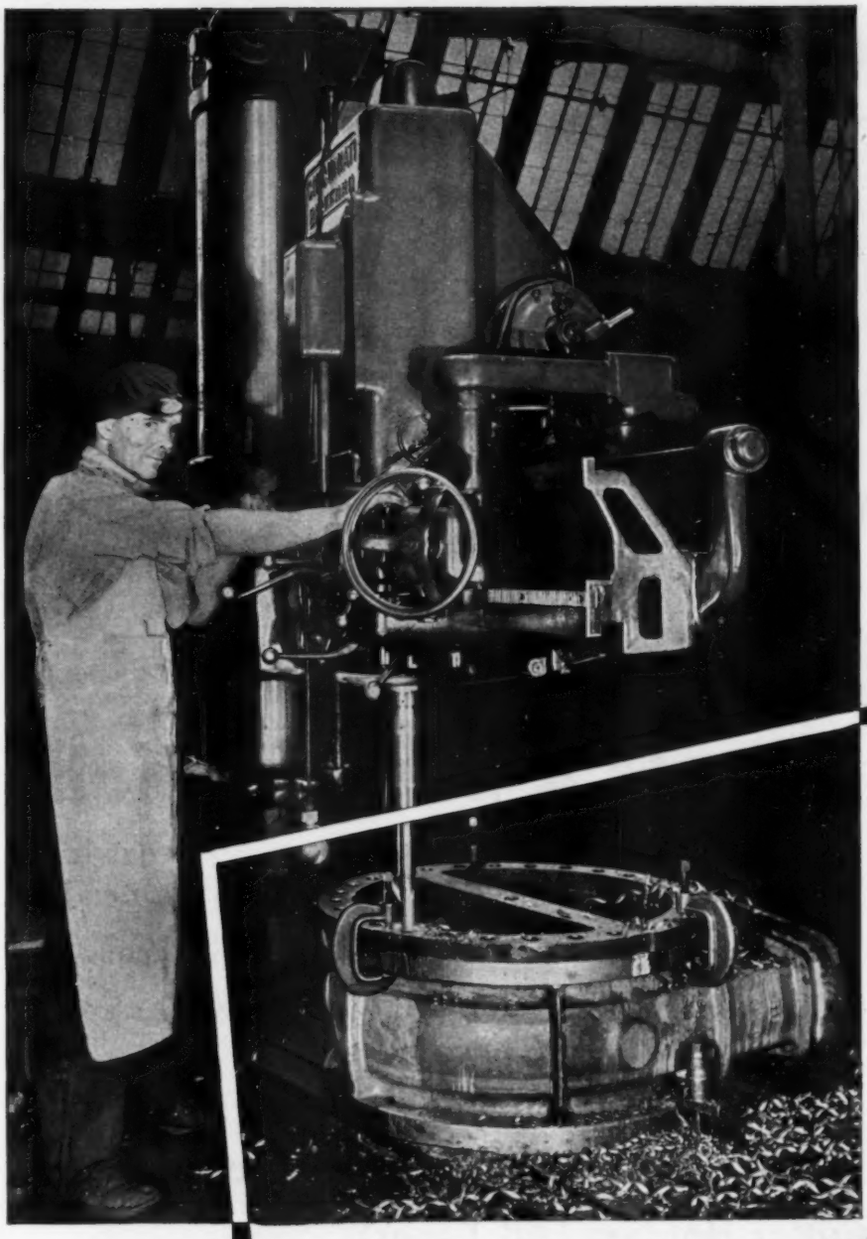
- Least number of parts.
- Simplest construction.
- Hardened and ground throughout.
- Cut close to shoulder threads without special chasers.
- Easily adjusted for thread size.
- Require no springs to operate movement of chasers.

Made in four sizes having capacity for cutting:

Straight Threads from ⅛" to 1¼"
Straight or Taper Pipe Threads from ⅛" to ¾".

Send for your copy of Bulletin M-142 on Modern Rotary Type Self-opening Die Heads!

CONSOLIDATED MACHINE TOOL CORPORATION
MODERN TOOL WORKS
DIVISION
ROCHESTER, NEW YORK



. . and still More Speed

Industry moved pretty fast for "Defense"; now it girds itself for even greater speeds. A Radial Drill which responds to the "all out" demands of industry geared to an unprecedented War production is the Cincinnati Bickford Super Service. In numerous plants batteries of these famous Radials are delivering peak production 24 hours a day, 7 days a week—delivering priceless assets of Accuracy and Absolute Dependability. Cincinnati Bickford designs, aimed at "more-holes-per-dollar", are today proving their value.

● Operations Photograph: Courtesy The Darling Valve & Mfg. Co. Drilling 78 holes, 1⅜" dia. through 2 1/16" cast steel. Floor to floor time 103 min. "More-holes-per-dollar" design nets savings of 15% over machine previously used on this job.

SUPER SERVICE RADIAL

ARMY E NAVY
AWARDED SEPT 10, 1942

SUPER SERVICE

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.

An Important Message to All Turret Lathe Users:

Don't Buy Standard Turret Lathe Tools Unless You Need Them *Now!*

There is a definite shortage of Turret Lathe Tools to equip machines for vital War Production.

Return For Credit Surplus New Warner & Swasey Tools

Defense Plant Corporation will authorize the return of surplus materials. Present shortages cover practically all standard tools shown in Warner & Swasey Tool Catalog No. 38. Greatest shortages are on the following items:

Single Cutter Turners **Multiple Turning Heads (All Types)**
Slide Tools (All Types) **Adjustable Turning Heads**
Angle Cutter Holders (All Types)

Return for credit any new Warner & Swasey tools. For instructions write or phone the nearest Warner & Swasey office:

Boston . . . . . Kendall Square Building
238 Main St., Cambridge, Mass.
Buffalo . . . . . Iroquois Building
Church and Franklin St.
Chicago . . . . . 618 W. Washington Blvd.
Cleveland . . . . 5701 Carnegie Avenue
Dayton . . . . 436 Mutual Home Building
Detroit . . . . . 1308 Maccabees Building
Houston . . . . . 409 Velasco Street
Los Angeles . . . . 1118 Santa Fe Avenue
Milwaukee . . . . . 818 Wells Building
324 E. Wisconsin Ave.
Newark . . . American Insurance Building
15 Washington St.
Philadelphia . . . . . 6910 Market Street
Upper Darby, Penna.
Pittsburgh . . . 505 Medical Arts Building
Syracuse . . . . . 517 Erie Boulevard East

WARNER & SWASEY FOR VICTORY

WHAT'S IN THIS ISSUE

WILLOW RUN

The eyes of industry have been on Ford's Willow Run plant for the production of B-24 bombers. For the first time, mass production automotive technique is being applied to aircraft. It is true that the aircraft industry has progressed far beyond its pre-war hand-production methods. But Ford has gone further; he has used all-out methods of interchangeable manufacture including complete jigging and steel dies. Here is the first story that describes the tooling philosophy behind Willow Run. Page 1441.

P. E. ROUSSEAU

PLANT ALERT

Just because we have the Axis under pressure is no reason for letting up on our precautions to protect American industry. Westinghouse's East Springfield plant is a good example of an organization that is ready. Months of training went into developing personnel for emergency functions. Then the set-up was tried out with a surprise "alert." P. E. Rousseau, of Westinghouse, describes the result. Page 1419.

ALL DAY, EVERY DAY

When Warner & Swasey went to three-shift operation, it didn't have enough inspectors to go around. It soon found that inspection became a bottleneck and that taking skilled men away from productive operations was not the answer. So, taking the plunge, it recruited unskilled men and women for this work. Even the skeptics in the organization were amazed by the adaptability of lawyers and housewives to machine tool inspection. Now this department works round-the-clock and keeps pace with production. Be sure to turn to page 1424.

STOVES FOR THE ARMY

The assembly of army cook stoves for field use poses a difficult problem. These units have to withstand high temperatures and hard usage. Silver brazing proved to be ideal joining medium. The technique used is described by Herbert Chase. Page 1426.

SMALL SHOP IDEAS

Did you know that copper wire wrapped around the arms of heat-treaters tongs will keep the handles cool? A small shop operator found this out and passes the idea along to *American Machinist* readers. This is only one of a page of kinks discovered in small shops. Page 1423.

SUGGESTIONS FOR VICTORY

Again we publish a group of suggestions recognized as meritorious by the Board of Awards, War Production Drive. These practical shop ideas have been passed upon by plant labor-management committees, and sent to the drive headquarters in Washington. *American Machinist* is assisting in the plow-back of these ideas into other industrial plants. Page 1433.

SHARPENING FIXTURE

Not having a machine to sharpen thread hobs, Roland Gerhart, chief engineer, the Duplex Printing Press Company, designed a fixture to do the work. This device rotates the hob and traverses it longitudinally while the faces of the flutes are ground. The leads can be altered readily to accommodate a wide range of tools. Page 1429.

TOOL MAINTENANCE CONCLUDED

Upkeep of press tools is made a lot easier by the correct design of details. Such components as trigger stops, bumpers and stop guides, if made correctly at the outset, will cause little trouble. H. R. Hageman discusses this topic in the fourth and last article of his series. Page 1436.

QUALITY CONTROL

Demands for thousands of parts in munitions manufacture called for a new method of quality control. Accordingly a new standard was set up

JOHN GAILLARD

by a committee under the auspices of the American Standards Association. Their findings called for a statistical control, which is not sampling as ordinarily practiced. Instead, the purpose is to anticipate trouble and locate its source before it becomes serious. John Gaillard, A.S.A. mechanical engineer, tells about it in the first of two articles on the subject. Page 1430.

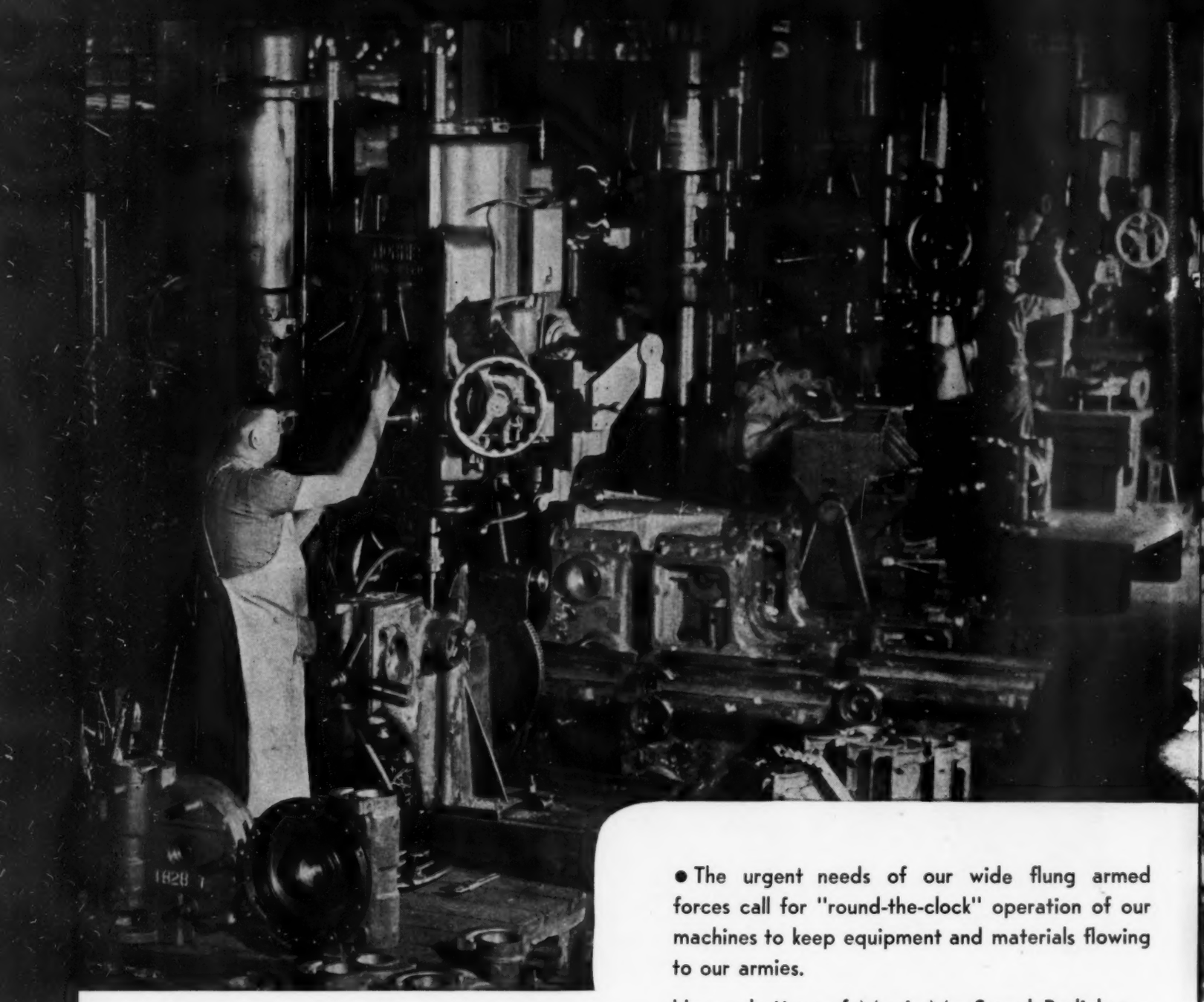
SCREW THREAD GAGES

Because of the importance of precise screw threads in many war products a new standard on the subject of thread gaging is timely. Two pages of the standard, which appear in this number, are devoted largely to definitions and nomenclature. The remainder of the standard will follow in subsequent issues. Page 1457.

COMING

Probably no other American aircraft has excited public imagination so much as the famed Flying Fortress. Its exploits over North Africa, Germany and the Pacific Islands have won it a reputation as a bomber capable of fighting its own battles. During the past year Douglas and Vega have joined Boeing as producers of this ship. An early article will describe the Douglas set-up for fabricating the wings that have carried the B-17 on so many flights over enemy territory.

One of the operations that has loomed into prominence because of war-time necessity has been the spot welding of aluminum and its alloys. To bring our readers up-to-date on the subject, a pair of articles will soon appear.



AROUND THE CLOCK PRODUCTION with

MORRIS MOR-SPEED RADIALS

● The urgent needs of our wide flung armed forces call for "round-the-clock" operation of our machines to keep equipment and materials flowing to our armies.

Here a battery of Morris Mor-Speed Radials are performing various operations on a number of different jobs on a "round-the-clock" schedule.

Ease of operation through convenient, centralized controls . . . a wide selections of feeds to accommodate a variety of work—and an equally versatile range of spindle speeds quickly available give all the operating facilities for greater production —faster production and lower costs.

Write for bulletins giving full details on standard 9"—11"—13" column machines.

PRATT & WHITNEY exclusive sales representatives for the U. S. A.

Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI, OHIO

ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor

READY FOR A RAID

A surprise "alert" found this war plant prepared for an air attack—the result of months of carefully worked out plans

BY P. E. ROUSSEAU, WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

WITH THE REALIZATION that, in case of an enemy air raid, local civilian and property defense organizations would be seriously taxed, Westinghouse Electric & Manufacturing Company has set up, in its East Springfield, Mass., plant, a completed defense organization. Drawing from its own personnel, Westinghouse trained auxiliary fire fighters and policemen. First aid, demolition, rescue and salvage units were formed and trained. A control center was established and equipped with telephones and personnel designated to man it.

How well the organization works may best be understood by a description of a test "raid," staged as a surprise early in June. At shortly after 9 a.m. the alert was sounded. Report center operators, warden, police, fire and all the other services were on the job in a flash. Formal routine reports from wardens all over the plant came in to the center, and the chiefs checked all wardens' posts to be sure all were accounted for.

Some eight minutes later the "trouble" started. Within two minutes, roof spotters reported five incendiary bombs and their locations. Fire fighters rushed to the sections and quickly and efficiently handled them. A wooden test shanty, erected at a safe place in the factory inclosure, and filled with oil soaked wood, went up with a roar and

the hard pressed fire fighters were again on the scene.

A "high explosive bomb" "smashed" through a multi-storied building and "penetrated" three floors, causing "casualties," "broken pipe lines," "fire," and "weakening the walls in several sections." First aiders rendered temporary aid to the "victims"; the various hospital stations, doctors and nurses there rendered further assistance.

"Saboteurs" Caught

At the height of the activities, a call came through to the report center that strangers were seen climbing over a fence into the plant. These "strangers" were shop employees, posted in the rear of the plant property for this particular incident; it was thought that, during a real raid saboteurs might try to enter the plant. Two minutes after the call, the "saboteurs" were apprehended by plant police officers and brought to the chief's office.

The activity during the "raid" was so great that services were taxed to the utmost. The plant fire department was called to eight different locations in a period of three minutes; yet, so finely organized were they that every call was answered promptly. This proved the efficiency of dividing each of the two fire groups into squads of five men each. A squad answered each call and if additional help was needed, another squad was sent. If the department had not been so subdivided, they could not have taken care of a third of the fires.

A member of the plant fire department took a quantity of incendiary bombs in a company car and set them off at pre-arranged safe locations. The many bombs and fires were detected by the roof watchers and wardens and reported to the center. All of these incidents were planned unknown to the protection personnel.

The report center functioned perfectly and handled a total of over 112 calls in less than a half hour. Thirty-six calls for aid of one type or another came in within a total elapsed time of only six minutes, attesting to the efficiency of the operators under fire.

The results of the first air raid drill and the enthusiasm with which the plant protection organization functioned was most gratifying, and a constant repetition of similar drills has served to keep the protection organization on the alert at all times.

The successful coordination of plant personnel, during this test raid, goes back to October, 1941, when company officials instituted the plant protection organization. The task was tremendous and involved the protection of a plant covering almost 50 acres and embracing buildings with over a million square feet of floor space. In addition, over five thousand employees had to be provided for in the plans.

The organization progressed slowly at first, but after the fateful bombing of Pearl Harbor, the entire machinery of protection was at once thrown into high gear; since the foundations of the plan were so well established, the East Springfield works had a fine start on its intensive protection plans.

A Nucleus Existed

The transition from peactime to wartime production offered many and varied problems. Fortunately, the nucleus of vital emergency services had been in existence for many years at the plant, and the augmenting of these services, and the addition of new protective facilities were rapidly completed.

One of the most constant possible sources of wartime production interruption and physical damage is sabotage, and the plant protection organization recognized the possibility in its initial

Auxiliary firemen extinguish a blazing test shanty previously erected in a safe area, filled with inflammable material and ignited by an incendiary bomb during the raid

During the "raid," the report center in a secluded room of the plant functioned perfectly, handled over 112 calls in less than a half hour—36 of them in 6 minutes. A complete defense personnel is set up in each shift

A bombing "casualty" is treated at a quickly set up first aid station. The regular plant hospital is augmented with five emergency hospital locations. Large metal boxes at these locations contain equipment and supplies

plans. The industrial police force at the plant was augmented in numbers and began a course of study in wartime duties to train them for the new problems confronting them. Rigid rules for employee's admittance to the plant were set up. Identification badges were issued to the employees. Their badges are of various colors, so that police officers may readily detect employees moving from one department to another without authorization. Constant vigilance by the officers at the gates and in the plant is maintained 24 hours a day. Two observation towers, especially constructed high above the surrounding buildings, are manned 24 hours a day and equipped with movable spotlights and high powered rifles; officers in the tower have unrestricted view of the fence lines and the surrounding territory.

Training Fire Fighters

The plant fire department was likewise augmented and trained in the latest methods of industrial fire fighting. A full-time fire chief is employed and equipment is checked daily. In addition, reports of fire hazards, obstructed equipment and the like are investigated at once, assuring the operating efficiency of all fire equipment at all times.

The actual protective set-up for passive defense was, of course, an entirely new problem. Emergency services were needed and the first task was to appeal to employees for volunteers for these industrial defense groups.

Notices were posted on the plant bulletin boards requesting such volunteers for services as wardens, auxiliary police, fire fighters, first aiders, rescue, demolition and salvage squads.

The initial response to this appeal was extremely gratifying. Employees from virtually every department, foremen, engineers, assemblers, janitors, clerks, etc., answered the call. Then began the task of training the volunteers. First aiders were taken in hand by Red Cross instructors and were given standard courses of instruction. Rescue, demolition, salvage, auxiliary fire and police groups were instructed in the duties of their particular plant protection role. The wardens were given a regular civilian defense course in the duties of an industrial warden.

The volunteers were organized into three shifts, so that the emergency protection facilities were available on a 24-hour basis.

While the training of the personnel was in progress, equipment was provided for emergency use. A complete report center was established in a secluded room in the plant, where telephone lines were connected for the exclusive use of the emergency organization. Sand cans, rakes and shovels were placed on the roofs of all buildings and inside buildings likely to be penetrated by incendiary bombs. Several hose lines were connected to water outlets placed on the roofs of many buildings and adjustable to operate either in spray or stream form.

Blackout Precautions

Blackout provisions were made. Vital centers whose operation was essential to the emergency plants were equipped with blackout curtains and special lighting equipment for use during such periods. All exits, stairways and fire equipment locations were marked with luminous signs so that their location would be readily discernible during periods of blackout.

The task of protecting the entire plant with its extensive territory was considered in detail, and the final decision was to divide the entire plant into posts. Forty-six posts were made and

each post was detailed on a special map. All exits, stairways, first aid and fire equipment locations were noted and the emergency personnel assigned to each post were carefully instructed as to equipment and unusual and hazardous conditions existing in the particular section involved.

A warden, alternate warden, police, first aid personnel and fire fighters were assigned to each of the 46 posts. A post telephone was designated for official emergency use. The post warden is considered the key man of the post. He is assigned a confidential report center telephone number to call for additional help and it is the warden or his alternate who has exclusive use of the phone. Requests for aid of any type needed on the post are given to the warden and by informing the report center of such need, he is sent whatever extra help may be necessary.

At each of the posts is hung a white cloth bag marked "Warden" and in the bag is contained the warden's equipment: A hard hat, special blackout flashlight and regulation civilian defense armband. Each bag serves the warden on all three shifts, eliminating the necessity for purchasing material for each shift.

Nerve Center of Defense

The plant report center is the clearing house for all warden's reports and the nerve center of the entire set-up. The center contains outside telephone lines to receive alert and air raid warnings from the city report center.

The control room hook-up consists of sixteen inside plant telephones. Ten of these phones are located on two tables in the control center. These phones are operated by young ladies on the first and second shifts and men on the night shift. Instructed and trained in their duties in the report center, these operators handle calls from the post wardens. Approximately five wardens make their calls to each of these ten telephone numbers. All the messages received on these phones are turned over at once to the protection chief or his alternate.

At another table in the control center sit the police, fire, medical and emergency chiefs and the chief warden, along with the plant protection chief. Before each is a telephone. This group of phones is used exclusively for the transmission of orders and information to various individuals and groups. After messages received on the ten incoming telephone lines have been turned over to the protection chief, he in turn gives the message, written on a regular report center form, to the chief of the service requested. The message is then transmitted to the squad location and necessary help is sent to the area needing it.

When such service units have been dispatched to a post, and have returned to their quarters, the report center is called and they are checked in. In this way, the report center is always aware of the exact number of emergency workers available for additional calls.

The report center personnel is called to duty only when a drill or emergency takes place, the set-up being flexible enough to allow the entire center to be ready to operate within two minutes of the alert signal. Five extra operators are always available for duty and answer all calls so that the possibility of a vacant phone is eliminated.

Runners If 'Phones Fail

Carrying through the theory of positive protection, the possibility of telephone damage or failure during a raid has been provided for by assigning three patrol runners to each plant post and emergency runners to the report center. Thus the entire set-up works as well and almost as quickly without the use of the telephones.

The double security method of protection is not confined to the report center and posts. It is carried out in every phase of the plant protection plan. The regular plant hospital is augmented with five emergency hospital locations. These emergency centers are located strategically throughout the plant. Large metal boxes placed on stands and marked "For Doctors and Nurses Only" contain two emergency cots, blankets, medicinal and surgical equipment. In fact, all the equipment necessary in the plant hospital is available, except the hospital furniture.

During a drill or actual raid, the regular fire department alarm boxes are not used. The calls for fire aid must be placed through the report center by means of the post warden. The fire department personnel is divided into two groups, each stationed at a central location. Upon receipt of a fire call, the report center fire chief dispatches a squad from the group nearest to the department requesting aid.

Salvage, demolition, rescue, decontamination and repair squads are located in central sections during an alert or practice and if the report center receives a request for services of the group, no time is lost in answering the call. In addition, fire calls received that involve departments containing hazards or equipped with unusual electrical equipment, result in the automatic dispatching of trained service repairmen.

The task of actually working the personnel of the plant organization into the actual operation of the system was accomplished gradually and without undue difficulty. After the wardens had been trained, they were issued a special folder containing the general plant protection plans and a special form to be filled in by each warden, giving his post number, boundaries, post and report center telephones, names of patrol runners and any special information needed for that post.

Wardens and other plant protection workers were then told that on a certain day the alarm would be sounded and that they were simply to go to their post telephones, call the report center and report their presence on post. This procedure was followed for three separate drills and served a dual purpose. It trained the wardens in answering the alarm and contacting the report center and, in addition, gave the report center personnel a chance to handle the heavy volume of calls.

After the preliminary test, the weekly drills were gradually increased in coverage so that first aid workers were included and subsequently all branches of the emergency services.

Practice Makes Perfect

Early in May, the organization was considered ready for a complete test. Several days of preparation were necessary to assure as realistic a drill as was possible and to give every branch of the plant protection organization a complete work-out under conditions as like an enemy raid as was practical. There was the additional problem of having employees continue working in war production departments, so that no lost time would result.

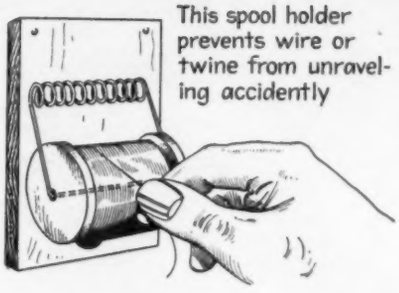
A special notice was posted on the plant bulletin boards several days in advance of the drill. The notice told the day, but not the time of the alert and requested employee cooperation.

Incendiary bombs were procured, wardens in a building to be theoretically pierced by a high explosive bomb were notified of what actually would be expected and the time of the incident. "Casualties" caused by the raid were anticipated in advance and tags given a few key first aid workers to attach to employees at the time of the raid. These tags mentioned the exact "injuries" received by the victims.

The speed and efficiency in which all the "incidents" were handled during these test drills, shows that the Westinghouse plant at East Springfield is equipped and has trained personnel ready for any emergency. It is an example of how a passive defense set-up may be applied to any individual establishment for the protection of manufacturing facilities which are so vital to the success of our armed forces.

SHORT CUTS FOR THE SMALL SHOP

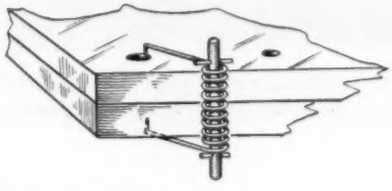
BY A. H. WAYCHOFF



This spool holder prevents wire or twine from unraveling accidently

SPOOLED WIRE, string, twine and thread often unrolls accidently and becomes tangled. This can be avoided by taking a mousetrap, cutting the spring as shown, and inserting the spool of wire. The spring will hold the spool rims tight against the wood base of the trap, and furnish enough friction at the rims to prevent the wire from unraveling accidentally. The spool and trap may be attached to a wall with a nail or screw.

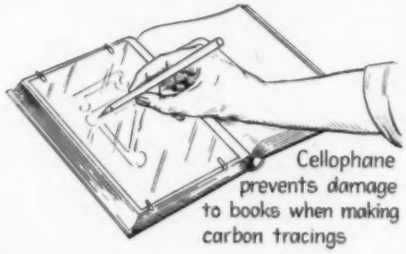
Coiled spring on rod permits scribing of blind holes



BLIND HOLES can be transferred or scribed with the aid of a stiff coil spring, the last coils of which have been straightened out, sharpened and bent at right angles so that the ends come nearly together. A rod or pipe, a little longer than the spring and selected for a snug fit inside the coils, prevents the spring from bending or kinking when it is stretched. Stops for the spring are made by inserting pins at the end of the rod. To use this device stretch the spring against the stops, insert one point in the hole in the templet or pattern, hold the rod perpendicular or vertical, and scribe the hole location in the blank.

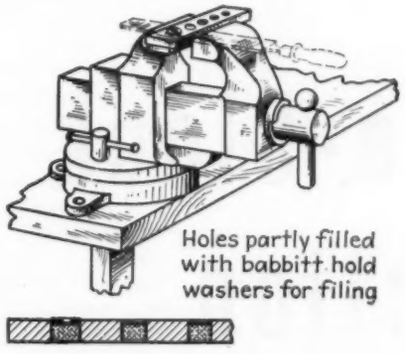
Auxiliary pieces for chuck jaws hold small drills securely

SMALL DRILLS cannot be held easily in square-shank braces or breast-drill chucks unless auxiliary pieces be added to the chuck jaws. Such pieces can be made by cutting a corner from standard angle iron, leaving the legs ¼ to ⅜-in. long, and making a steel block to fit in the V of this angle. The angle and steel block, with the drill in the bottom of the V, will clamp the drill tightly when the jaws are drawn up.



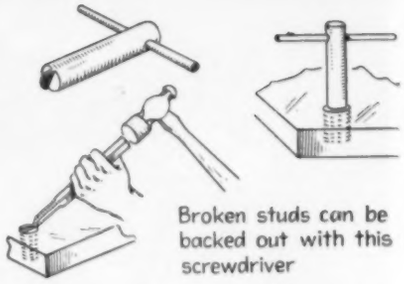
Cellophane prevents damage to books when making carbon tracings

TRACINGS from book illustrations can be made without marring the original by placing a piece of white cellophane over the illustration, and a sheet of carbon and copy paper beneath the page. The outline of the illustration, readily visible beneath the cellophane, can be traced. The cellophane is tough enough to prevent the pencil point from either marking or tearing the book.



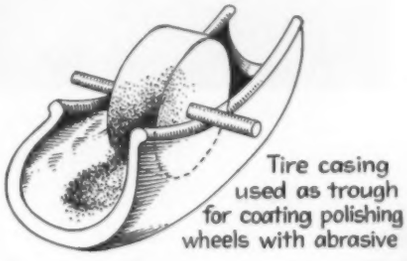
Holes partly filled with babbitt hold washers for filing

THIN WASHERS are needed frequently around the small shop, and are usually made by filing down standard washers. It is quite a problem to hold the washers for filing, unless a holding block like the one illustrated is used. This block was made by taking a ½-in. steel plate and drilling therein holes of diameters equal to that of most commonly used washers. The drilled block was placed on a smooth board and three-ply cardboard disks placed in the bottom of the holes. The holes were then filled with babbitt. The steel block was inverted, and the cardboard disks removed. This left cavities wherein washers can be placed. When the block is held in a vise, the washers can be filed down quickly.



Broken studs can be backed out with this screwdriver

BROKEN STUDS can be removed easily with this tool made from drill rod. The chisel should be shaped as shown and ground to a width equal to that of the semi-circular wing on the drill-rod screwdriver. When removing the stud, gouge the hole from each end so that the slot will be deep at the center. Then a few taps of the hammer will drive the tool into the slot. Some studs can be backed out by hand. If too tight for this, a small Stillson wrench can be used.



Tire casing used as trough for coating polishing wheels with abrasive

ROLLING TROUGHS made from old automobile tire casings are better than the usual built-up wooden troughs for applying emery or other abrasives to felt or cloth polishing wheels. The casing should be 12 to 16 in. long. The wheel, with a stick through the center, is rolled back and forth in the usual way after the glue or cement has been applied. Remaining abrasive can be salvaged because it can be poured readily from the casing into the container.

Copper wire wrapped around heat-treaters tongs will keep the handles cool

TONGS used by blacksmiths, rivet heaters and heat-treaters become uncomfortably hot with constant use. The handles will be cooler if copper wire be wrapped around them, because it will facilitate dissipation of heat into the air. The coiled wire should come to within 6 or 8 in. of the end of the handles.

REPETITIVE INSPECTION in the contract work department is being done by new employees after two weeks preliminary training

Round-the-Clock Inspection

Should inspectors be chosen on the basis of their shop experience? Fine—when they are available. When they are not, men and women new to industry can be trained in short order

It is all right to put machining and assembly departments on a three-shift basis even while diluted with inexperienced operators, but somehow inspection is different. The quality of the product depends on inspection; therefore inspectors should have a good shop background and preferably be skilled in the operations they are passing on. It would seem to follow that three-shift operation depends on a good supply of experienced employees.

That is what the management of the Warner & Swasey Company thought until inspection became a choke point in production; then they took the plunge and put inspection, too, on a three-shift basis. They did it without robbing other departments of experienced personnel and without spending months training green hands for the work. Above all, they made the change without compromising quality.

This is the way it was done. New employees at Warner & Swasey are hired by the employment department and, if unskilled, are put into a quick training course or vestibule school. From this group, prospective inspectors

EXPERIENCED MEN still safeguard the quality of the product, checking the alignment and functioning of completed machines

were selected from the aptitude they showed in their first week's work. If qualified, they were shifted immediately to a special inspection course which lasted only two weeks. In it, they were taught the use of gages and measuring instruments, shop mathematics and blue-print reading.

Men of all walks of life have taken this course, and today the company has ex-musicians, ex-doctors, lawyers, automobile salesmen and even an undertaker, inspecting its products. Women inspectors are now being adapted to their new duties under the same procedure.

Inspectors are first put in the contract work department where the parts made by outside shops are received. While these parts are no different from other machined components, they are usually received in large lots and therefore the new inspector can be put on work that is more repetitive than would be found in the machining departments. Thus, after the few inspection operations on a single part are explained, the new man or woman can work for a considerable time handling the measuring tools and thus learning his trade while being productively employed. In short, the two-week school training is just a preliminary step; the employee's education continues as long as he is at work.

The second step is departmental inspection. Warner & Swasey gives each inspector a battery of machines, averaging about fifteen, on which the inspector checks up continually while they are at work. Naturally, he checks the parts from a new set-up and then continues to inspect them as they are completed. He works from one machine to the next and as a general rule gives each part a 100 percent inspection. When the order is completed the inspector is there to check up the last parts on the run so there is no delay in passing the work on to the next operation. This method avoids the accumulation of parts in a centralized inspection department.

The supervision of fifteen or so machines, each of which is likely to be working on a different part, takes more versatility than the kind of work done in the contract department. Men having had about four months' experience on the contract work are now serving as departmental inspectors.

The influx of new men and women permits the use of experienced inspectors on the more advanced jobs. The work requiring the highest degree of skill is final inspection in which every function of the machine is checked for accuracy. The inspector makes his report on a form which serves as a check sheet for the correct performance of each machine element.

In addition, each machine is given a cutting test. After inspection is completed and the machine is painted for shipment, another man, called an "inspection checker," looks over everything carefully and if doubtful about any function of the machine, may repeat some detailed inspection steps.

Still another department, called "sales order inspection," checks tools and parts required by the customer which are not part of the machine proper.

So far, these steps in final inspection are still in the hands of experienced men. But newcomers are showing such surprising aptitude that they too will soon qualify for this work.

The army field stove includes two tanks, one for air and one for gasoline, connected by a manifold of silicon-bronze

ASSEMBLY BY SILVER BRAZING

BY HERBERT CHASE

LOW TEMPERATURE silver alloy brazing is done in large quantities by the William R. Bootz Manufacturing Company in assembling Army field range fire units. These units are designed for use in cooking when the Army is in the field. They have to be sturdily built to withstand hard usage. The brazed joints not only have to be strong to resist mechanical injury and corrosion, but also to withstand temperatures which, under adverse conditions, often exceed those at which ordinary soft solder would melt. Naturally, the joints formed have to be and remain free from leakage.

The silver brazing alloy used penetrates into small clearances to effect joints of high strength. Very little brazing alloy is needed per joint and, as the work is rapidly done, costs are moderate.

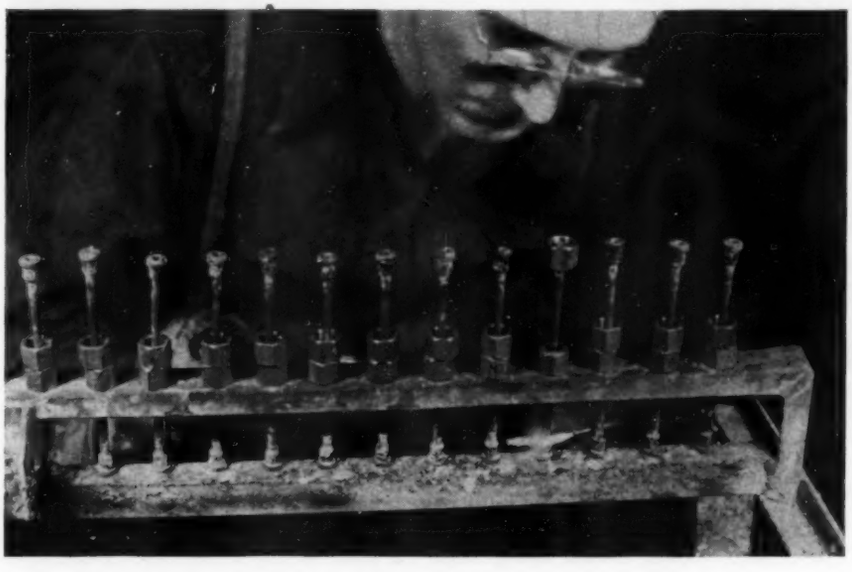
In the fire units assembled in this plant joints are made between steel and steel, between steel and brass, and between silicon bronze and silicon bronze. Only one brazing alloy is required. It contains 50 percent silver and flows at 1175 F. It is used in combination with a flux which is liquid and completely active at 1100 F. Most of the joints are made with the brazing alloy in the form of 3/64 in. diameter wire but the largest joints are made with $\frac{1}{16}$ in. wire. Besides silver, the alloy contains copper-zinc and cadmium.

The range unit includes two silicon-bronze tanks, one for air and one for gasoline. These are connected by a manifold made from silicon-bronze tubing with brazed fittings. Similar tubes with brazed fittings connect other parts of the unit, one of these being a vaporizer made from seamless steel tubing welded to a central fitting. Brass fittings are brazed to the steel vaporizer tube near one end and near the opposite end a short piece of steel tubing is brazed to the vaporizer.

In all, sixteen joints are brazed in the complete assembly. All of the work is done at benches. Torches use a mixture of natural city gas and oxygen, the pressure from the city line being raised by a shop compressor. Some of the torches have a single tip and some double tips. The combustible mixture is fed to the torches through gas savers having a small pilot flame. The main flow is shut off automatically when the torch is hung on a hook. When lifted from the hook, the pilot flame lights the gas mixture flowing from the torch tip.

Two brazed joints are made where brass fittings are screwed into tapped holes in one of the vaporizer tubes. As the threads hold the fittings in correct relative position, no fixture is required. After several burners, with fittings in place, have been laid out on the bench, flux is applied with a brush. Threads are purposely made rather loose so that the brazing alloy will penetrate into the joints. Heating in this case is done with a single-tip torch and the brazing alloy is flowed in as the wire is fed by hand after the assembled joint has been raised to brazing temperature.

Tanks to which fittings are to be brazed are received with holes pierced to correct size. Fittings and tank are made from silicon bronze and the former have a lip which fits the corresponding hole and a narrow flange which rests against the cylindrical surface of the tank. The lip and flange position the fittings so that, again, no holding fixture is needed. Tanks are laid on the bench, are held so that they will not roll and, after the fittings are set in place, fluxed heat is applied using a single-tip torch. As the fittings have a heavier section than the tank, most of the heat is applied to them, but both the fittings and the tank are heated enough to cause the brazing alloy to flow freely and penetrate throughout the entire surface of the joint.

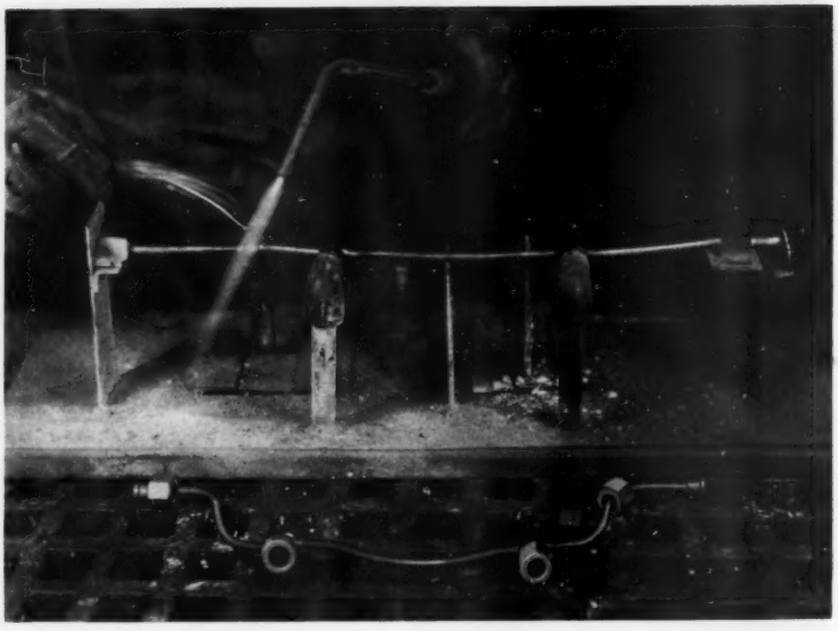


A simple fixture is used to hold the parts in correct relative position for making all other joints. One such fixture is used to hold straight lengths of bronze tubing on end while the lower ends are assembled in union fittings to which the tubes are to be brazed. The fixture or rack is made from angle iron, the upper piece of which has a series of slots, one for each tube. A few inches below this is another length of the angle iron in which is set a series of short pins, each arranged below the corresponding slot in the upper piece. The pins are a loose fit in the ends of the fittings and are of such length and diameter as to prevent tubes from slipping too far down into fittings.

A length of tube is placed in each fitting after it has been set over the

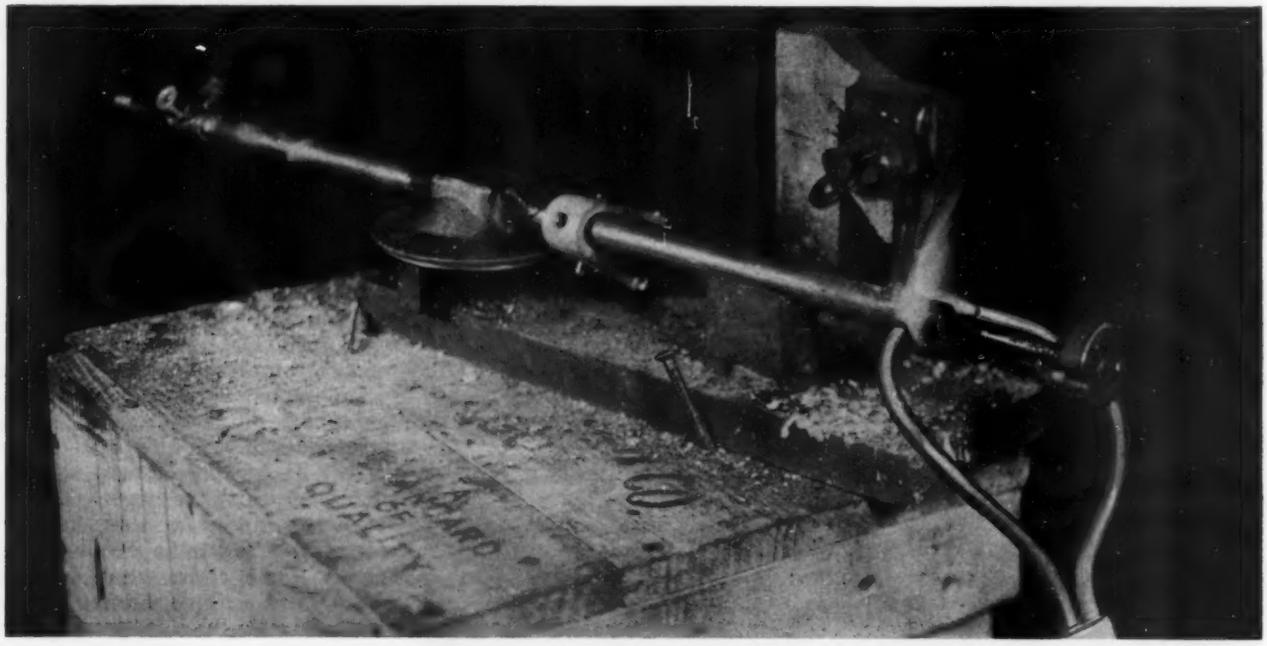
pin and rested in the slot which prevents the tube from toppling over. When in position, the tubes and their fittings are slightly inclined so that they rest against the back of the slot and do not require fastening. After loading the rack, a brush is used to apply a little flux at each joint. Then, with a double-tip torch, an operator heats each fitting in succession and flows the brazing alloy into the joints.

Several different lengths of tubing are handled in this rack. After fittings are brazed to one end, union nuts are slipped over the tubes and they are turned, end for end. Fittings are then applied in the same way to the other ends.



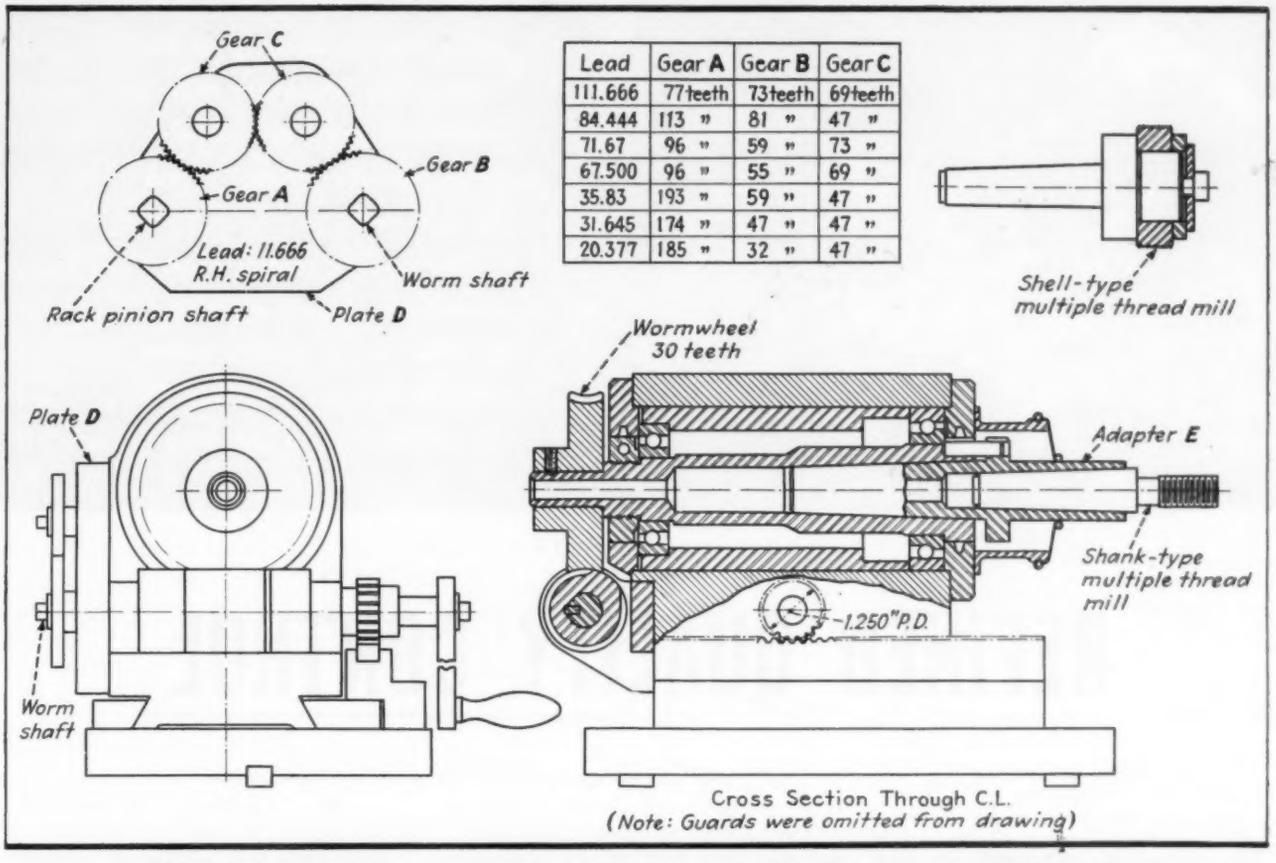
A manifold having three tee branches is made from one of the tubes before end fittings are brazed on. The tees are made from bronze rod which is cross drilled with a clearance hole to slip over the manifold tube and is also drilled with a hole part way through the axis. To insure proper spacing and angular relation of the tees, the tube with the tee fittings is set up in the fixture shown. Pins, which support the tees on the axial holes are carried on angle supports made from pipe nipples and elbows. Two of these supports are fixed, but the third is arranged on a slide so that it can be pulled back when the tube is loaded and unloaded in the fixture. There are also supports for the ends of the tube which position is endwise.

When the tube and fittings are in place, flux and heat are applied and the joints are brazed while the fittings are held in correct relative position. Subsequently, union fittings are applied to the ends of the tube, using the same jig used for the straight length of tube. After all brazing has been done, a drill is passed through the axial holes in the tee fittings to open holes through the tube wall. Then the tube is bent into the U-shape required to form a manifold with the tees in the position needed for final assembly at union joints.



A double-tip torch is used to apply heat for brazing a short "hot vapor" steel tube into a cross hole in the seamless steel tube of the vaporizer. After setting the vaporizer on the blocks shown, the short tube is placed in the hole and rested in a slot which, in combination with a button, holds the short tube at the required 83 deg. angle with the larger tube. A pin (with a handle for turning it) is temporarily placed in the bore of the large tube to prevent the small tube from entering too far and to keep the brazing alloy from running into the large tube when the joint is brazed. The same Handy Flux and silver brazing alloy, Easy-Flo, used for the other joints is employed for making this steel-to-steel joint and results in a joint having a high tensile strength.

Fixture Sharpens Thread Hobs


Gear C
Gear B
Gear A
Lead: 11.666
R.H. spiral
Worm shaft
Rack pinion shaft
Plate D
Lead | Gear A | Gear B | Gear C
111.666 | 77 teeth | 73 teeth | 69 teeth
84.444 | 113 " | 81 " | 47 "
71.67 | 96 " | 59 " | 73 "
67.500 | 96 " | 55 " | 69 "
35.83 | 193 " | 59 " | 47 "
31.645 | 174 " | 47 " | 47 "
20.377 | 185 " | 32 " | 47 "
Shell-type multiple thread mill
Wormwheel 30 teeth
Plate D
Adapter E
Shank-type multiple thread mill
1.250" P.D.
Worm shaft
Cross Section Through C.L.
(Note: Guards were omitted from drawing)

With this fixture a shop can accurately sharpen thread-milling hobs on a universal grinder, if a hob grinder is not obtainable or the volume of work does not justify its purchase

BY ROLAND GERHART, CHIEF TOOL ENGINEER, THE DUPLEX PRINTING PRESS COMPANY

A LIMITED NUMBER of thread-milling operations are performed in our plant on parts being made on war contracts. A hob grinder was needed, since an improperly sharpened thread-mill job will cause rough threads and inaccuracies that destroy the tolerances required on ordnance work. At the same time, the small number of hobs to be ground did not justify the purhase of a hob grinder, even if one could have been obtained at this time. Some other method was necessary.

We first tried to sharpen thread mills on a No. 2 Cincinnati universal grinder by picking up the lead and the index of the flutes with a finger. This method introduced the human element, and close grinding could not be maintained. For this reason, I designed a fixture which reproduces the original helical lead ground into the hob and establishes a means of grinding the flute spacing uniformly.

As shown by the cross-section in the accompanying illustration, a 30-tooth wormwheel is applied to the extreme left end of the adapter spindle. By turning the crank handle, the entire fixture is advanced to the grinding wheel by means of a rack and pinion, and at the same time the spindle is rotated to produce the required flute lead. Various leads are obtained by changing gears *A, B* and *C* mounted on plate *D*. The train shown in position will produce a lead of 111.66 in. for grinding a right-hand helix, right-hand cut thread mill hob. To grind left-hand helix hobs, one of the gears *C* is eliminated, thereby reversing the lead. Gear combinations to produce several leads are tabulated on the drawing.

Since the number of flutes generally vary it is necessary to supply various adapters, which are accurately bored with the respective number of holes, so that the grinder hand can index the thread mill properly. Assuming that adapter *E* was bored for 18 holes, this same adapter is usable for a nine-flute mill by skipping every other hole. It also can be used for a six-flute mill.

In order to obtain the proper gear ratio for any given lead it is necessary to make only a simple calculation. The ratio of the gearing is determined by the following formula:

$$\text{Gear Ratio} = \frac{1.250 \times \pi \times 30}{\text{Lead}} = \frac{117.809625}{\text{Lead}}$$

Then find the best possible gear combination which will fulfill this required gear ratio.

What Quality Control Means

Parts are accepted or rejected by ordinary inspection methods, and there the matter rests. More important than the gaging of individual parts are answers to the questions "What's wrong?", and "How can it be corrected?".

The quality control chart picks out controllable causes of variation. Often it detects a reduction in quality before it is serious enough to cause rejections. This anticipation of trouble aids in speeding the war effort.

REFINED QUALITY CONTROL

BY JOHN GAILLARD, MECHANICAL ENGINEER, AMERICAN STANDARDS ASSOCIATION

This scientific approach to and solution of quality control is presented in two parts—PART I

MANY MANUFACTURING PLANTS engaged in war production work complain about getting an excessive proportion of non-acceptable product or in other words, too large a "percent defective." This may be because the work is different from anything the plant has done before and the manufacturing tolerances specified by the government are closer than those to which the plant is accustomed.

As long as trouble of this kind persists, the manufacturer will say that he has not yet got "control" of the quality of his product. Such a condition calls for action. Although some of the defective product may be salvageable, there is loss of material, labor, machine capacity and—a highly important factor just now—loss of time.

Ideally, control of quality of a manufactured product would mean that every unit of that product meets its specified requirements. Thus, perfect dimensional control of machine parts would be achieved if the sizes of all parts manufactured fell within their gage limits. In practice, no such absolute perfection exists. The percent defective may be cut down to a very low figure, but we can never reasonably expect to get no rejections at all.

When the manufacturer said that he had attained control of quality, he usually meant that he had succeeded in keeping the percent defective down to a level satisfactory to him—a matter of personal judgment. If at first there were 4 percent defective, and he gradually brought it down to 0.5 percent, he might hold that he had attained control, even though by further efforts he could have reduced it still more.

This vagueness of the "traditional" concept of control has several practical disadvantages, some of which are quite important. For example, if the manufacturer, in spite of efforts to reduce the percent defective to an acceptable figure, has failed to do so, he may ask himself whether he should keep on trying or give up the matter as impossible. If the kind of work is entirely new to him, he may easily take the wrong decision and either give up, although the problem could be solved, or conversely, persist where success is out of the question.

Therefore, the "traditional" concept of control does not give the manufacturer a definite answer to practical questions like these: Can the percent defective be reduced by adjusting the production process in use, or must this process undergo basic changes before improvement may reasonably be expected? What is the highest degree of accuracy attainable with a certain production set-up—that is, with given materials, tools, machines, operators and methods of manufacturing and inspection? Is it practical, in a specific case, to shift from selective fitting to assembly of interchangeable parts, or are the considerably closer manufacturing limits required in the latter case prohibitive?

What Control Is

The manufacturer will get an answer to such questions by applying a technique described in a set of three American War Standards on Quality Control. Here the concept "control" is given a definite meaning and the manufacturer is supplied with a criterion for detecting lack of control. Also, where such lack is indicated, he knows that he must look for trouble in the production process so that he may find its

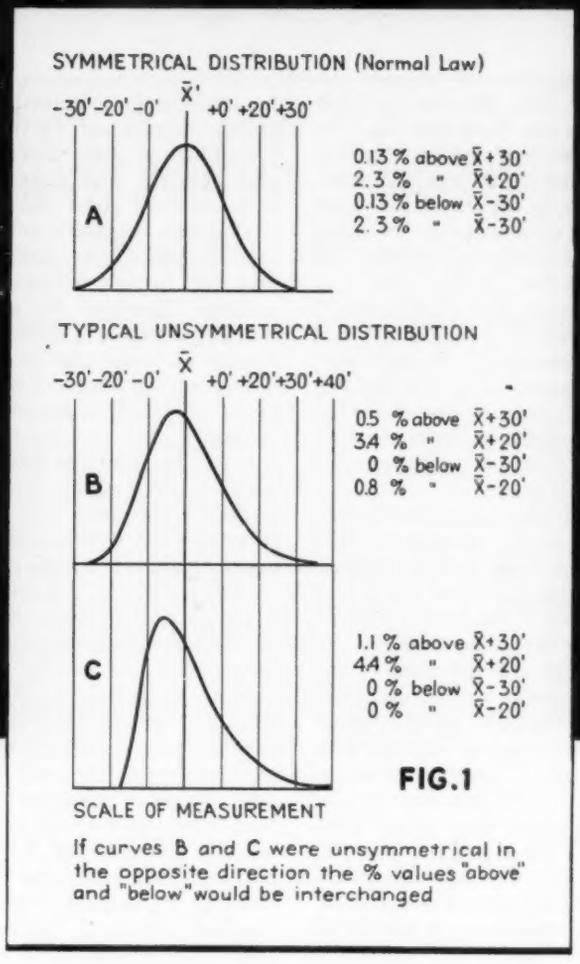

SYMMETRICAL DISTRIBUTION (Normal Law)
-30' -20' -0' X̄' +0' +20' +30'
A
0.13 % above X̄+30'
2.3 % " X̄+20'
0.13 % below X̄-30'
2.3 % " X̄-30'
TYPICAL UNSYMMETRICAL DISTRIBUTION
-30' -20' -0' X̄ +0' +20' +30' +40'
B
0.5 % above X̄+30'
3.4 % " X̄+20'
0 % below X̄-30'
0.8 % " X̄-20'
C
1.1 % above X̄+30'
4.4 % " X̄+20'
0 % below X̄-30'
0 % " X̄-20'
SCALE OF MEASUREMENT
If curves B and C were unsymmetrical in the opposite direction the % values "above" and "below" would be interchanged

FIG. 1

cause with the least possible delay and eliminate it, if practicable.

However, if there is no indication of lack of control, the manufacturer may safely assume—as wide practical experience has shown—that he is doing the best he can, with the process in use. Therefore, if this "best" is not good enough to meet the requirements of the product—specified, for example, in terms of manufacturing limits—he knows that he will be able to get product of the right quality only by making basic changes in the process and not by merely adjusting it.

Upon request by the War Department, the American Standards Association started in 1940 a project on the Application of Statistical Methods to the Quality Control of Materials and Manufactured Products. Three American War Standards, completed by an ASA committee[1] have so far been published. They are: Guide for Quality Control (Z1.1-1941); Control Chart Method of Analyzing Data (Z1.2-1941); and Control Chart Method of Controlling Quality During Production (Z1.3-1942).[2]

Before we can discuss control of quality, we must have a clear picture of what we understand by quality. Roughly, the quality of a product may be defined as its suitability for a given purpose. Hence, to be able to judge or measure quality, we must begin by specifying the requirements we want the product to meet, or in other words, the quality characteristics we want the product to possess. Such a characteristic may be dimensional accuracy specified in terms of the manufacturing limits within which certain dimensions of a workpiece must be held if it is to be accepted by the inspector. Other specified quality characteristics may be the tensile strength and the elongation of the steel of which the piece is made.

Specification of quality is most definite if the characteristics involved are stated in terms of measurement. If this is impossible, we may at least be able to establish a sample or model to serve as a basis of comparison for the product to be made. An example is the finishing of a workpiece to a "surface quality" represented by a sample block or disk.

So far, we have discussed the concept "quality" as relating to a unit of product—that is, to an individual piece, subassembly or complete article for which quality requirements have been specified. However, when we think of control of quality, we do not have in mind whether a given unit of product meets its requirements, but rather, whether or not the totality of the product, as it comes in lots or in a continuous flow from the line, is satisfactory in the sense that it contains a sufficient percentage of acceptable units. In other words, the product is considered here as a collection of units and the term "quality control" accordingly refers to the collective quality of the product. If all of the pieces in a lot of 1,000 are inspected and eight pieces are rejected, we can express the collective quality of this lot by saying that its percent defective is 0.8.

When Is Quality Controlled?

How small should be the percent defective in a specific case to justify our claiming that we have got control of quality? Is there any criterion that will aid us in answering this question?

Before we go more deeply into this question, let us consider the concept "collective quality" some more. Suppose we look at ten lots of 1,000 pieces each, and determine the percent defective of each lot by gaging all of its units. The collective quality of these ten lots considered together, may then be measured by the arithmetic mean or average of the individual percentages of the ten lots. This average represents their common level of quality which we would have found also by combining the ten lots into a large one of 10,000 pieces and determining the latter's percent defective.

However, when we have ten separate lots of 1,000 pieces, we come upon another aspect of their collective quality. This is the extent to which the qualities of the 1,000-piece lots deviate from their common quality level (average percent defective). If their qualities all are rather close to this common level, this is an indication that the overall quality of the product has a high degree of uniformity. If on the contrary, the qualities of the 1,000-piece lots are spread out or dispersed more widely, the overall quality appears to be less uniform. Therefore, the dispersion of individual qualities or group qualities about their common level of quality is a second important characteristic of collective quality. It gives a picture of the degree of uniformity of quality in the total volume of product under consideration.

To measure collective quality, we must have units of measurement for the level and the dispersion. We have already seen that the level can be simply

[1] Membership: H. F. Dodge, Bell Telephone Laboratories, chairman; A. G. Ashcroft, Alexander Smith & Sons Carpet Company; W. Edwards Deming, Bureau of the Census; Leslie E. Simon, Army Ordnance Department; R. E. Wareham, General Electric Company; and John Gaillard, ASA, secretary.

[2] The first two standards were published in a single pamphlet in 1941 and the third standard was published in July, 1942. Copies are available from the ASA, 29 West 39 Street, New York.

expressed by the average of the measurements (observations) of a given quality characteristic. If a quality characteristic X, such as the size of a workpiece or the tensile strength of a specimen of material, is measured on each of a number of units n, and the observations are: $X_1, X_2 \ldots X_n$, their average, $\bar{X}$ (pronounced X bar), is expressed by the formula:

$$\bar{X} = \frac{X_1 + X_2 + \ldots\ldots + X_n}{n}$$

To express the dispersion, we can use several kinds of measures. One of those commonly used in problems of this kind is the standard deviation (root-mean-square deviation) of the observations from their average. It is customary to designate the standard deviation by sigma (σ). In the example just mentioned, the standard deviation of the n observations from their average X is expressed by the formula:

$$\sigma = \sqrt{\frac{(X_1-\bar{X})^2+(X_2-\bar{X})^2+\ldots+X_n-\bar{X})^2}{n}}$$

Another measure of dispersion frequently used here is the range (R). This is the difference between the highest value and the lowest value among a set of observations, or $R=X_{max}=X_{min.}$ For example, we may take 25 samples of 100 pieces each, all of these being gaged, and determine the percent defective for each sample. If then the maximum percent defective observed in a sample is five, while the minimum is two, the range of percent defective for these 25 samples is three.

Other statistical measures used to express characteristics of collective quality are the fraction defective (p), which is the ratio of the number of defective units to the total number of units under consideration[a]; the number of defectives (pn) in a sample of n units; and the number of defects (c) in a sample of stated size, such as the number of flaws in 100 ft. of wire. What statistical measure or measures should be used must be decided in each individual case.

When a quality characteristic is measured on each unit of a lot of product, it is a simple matter to express the collective quality of the lot in such measures as the average, the standard deviation and the range, since these values can be computed from the observations made on the units. The problem becomes more complicated when 100 percent inspection is impracticable and the collective quality of a lot must be determined, with the closest possible approximation, from observations made on samples drawn from that lot. Inspection by sampling may be necessary because the inspection test is destructive (for example, the tensile test made on a specimen of material, or the firing test of ammunition)—or because 100 percent inspection, while technically feasible, is uneconomic (for example, where parts come in a large flow from an automatic machine). In such cases we can get a picture of lot quality only from the combined pictures of a number of sample qualities—each of which is in its turn a composite picture of a number of unit qualities.

In sampling inspection, the important question arises: In how far does a sample taken from a lot of product present a reliable picture of the quality of the entire lot? The answer depends on a number of factors, such as the sizes of the lot and the sample, and the degree of uniformity of quality in the lot. Since the make-up of a sample and hence, the relation between sample quality and lot quality depends on chance, valid conclusions regarding lot quality can be drawn from sample qualities only with the aid of the theory of probability. This fact, and in general the statistical background of the standards under discussion, need not dismay the technical expert not conversant with statistical theory. The practical tool to be used by the man in charge of quality control, which was developed through cooperation between the engineer and the statistician and described in the standards, requires merely the use of simple arithmetic. This tool is the quality control chart.

A Quality Control Chart

The quality control chart is based on the concept "statistical control" which will be briefly explained here.

The variations in the quality of a product, from unit to unit, or from sample to sample, or again, from lot to lot, are due to numerous causes. From the viewpoint of quality control, these causes may be divided into two classes: (1) causes of variation whose effect is insignificant and which, therefore, merit no investigation, and (2) causes of variation whose effect is significant in that they result in excessive fluctuations in quality and hence, must be eliminated if we are to get control. Causes of variation of the latter type are called assignable causes—which practically means causes of trouble. When the latter are found and eliminated from the production process, and the variation in quality has become insignificant, the production process is said to be in a state of statistical control or briefly, in a state of control.

The residual variation in quality is due solely to the combined effect of unknown causes which by their very nature cannot be weeded out systematically. Possibly, with increasing knowledge, some of these unknown causes may become assignable in the course of time, in which case their elimination will still further reduce the residual variation. However, for a given process, considered at a certain time, the amount of knowledge at our disposal determines the limit to which our finding of assignable causes and their elimination can go.

It will be clear that this approach to the problem of quality control becomes workable in practice only if we have a criterion to determine whether a variation in quality is significant.

Such a criterion is found by making a comparison between the unknown distribution of quality in which we are interested in a specific case, and a known theoretical distribution representing a "model" of perfect statistical control—that is, a distribution resulting from a condition where no assignable causes of variation are present. Such a comparison enables us to decide whether the observed distribution appears to deviate from the "model" distribution to such an extent as to indicate lack of control. This procedure is similar to the use of an optical comparator for checking the contour of a workpiece, such as a screw or a gear, against an ideal contour.

In the quality control chart technique, we use as the model of perfect control, the so-called normal distribution which is graphically represented by the normal frequency curve, or Gauss curve, shown in diagram *A*, Fig. 1. Its abscissas represent here the values of a certain quality characteristic observed on the individual units of a lot and its ordinates, the respective frequencies with which these quality values (observations) occur in the lot. The area included between the curve and the horizontal axis represents the total numbe. of observations. A mathematical property of this frequency curve is that approximately 99.73 per cent of the total observations fall within two limits located from the central line $\bar{X}'$ at equal distance $3\sigma'$, in which σ' is the standard deviation of the observations from the central line. Such limits are called "3-sigma" limits.

The diagrams *B* and *C*, Fig. 1, show unsymmetrical distribution curves. For both of these, the percentage of observations that falls outside the 3-sigma limits is larger than in diagram *A*.

This is the first of two articles on quality control. The second will appear in an early issue.

[a]The use of percent defective (100p) is often preferred.

Electronics—Secret Weapon of War

Presager of a New Scientific and Industrial Era

THE END of World War I left scientists with a new plaything. They did not know it at the time but they had their hands on a revolution. Within two years the world had radio broadcasting. Within ten years the whole art of motion pictures had been transformed as talking pictures replaced silent movies. Within twenty years television was born and people were seeing pictures in motion by radio.

The fulcrum of this revolution is the electron tube, a new tool of illimitable possibilities. One form of the electron tube is the familiar radio tube; the much publicized electric eye is another. There are many other forms, each having distinct capacities for saving time, saving energy, saving money, protecting life, limb and property.

The electron tube puts the electron to work—and the electron is the basic building-block of the universe.

Electronics is the new art, the new science of putting the electron to work. Radio and sound pictures and television are aspects of electronics; but there are many other facets of this revolution which have been brewing since the last war.

The electron tube has a typical American family tree. Edison made the basic discovery of the "Edison effect" some sixty years ago. This was followed by the invention of the "Fleming valve" and the "de Forest grid". Then Armstrong contributed his share, and hundreds of engineers in garret and cellar workshops and in the great university and industrial laboratories went to work on the tubes which employ electrons. The tube was a plaything before the last war but the world conflict brought it out of the toy stage and made it a practical, powerful tool.

Today the electron tube is guiding the destinies of the greatest armies and fleets ever engaged in the history of the world.

It is a part of the nerve center of the battleship, directing its course, finding its adversaries, broadcasting running accounts of air battles to its crews, directing gun fire and determining ocean depth.

In the air it is the means of locating and identifying enemy planes, piloting planes automatically, giving communication from plane to plane and to shore. It is even operating the controls of the plane.

In the maneuvering tank, in the officer's car, on the back of a foot soldier it transmits and receives vocal messages from every unit of the fighting forces.

Along our borders, and those of our Allies is an electronic screen which counts, follows and identifies enemy planes a hundred miles away through darkness and through fog.

In industrial plants there are electronic counters that enumerate passing articles faster than the eye can see; automatic sorters which discard defective, oversize, undersize, off-color articles; automatic cutters; devices which inspect the inside of things which the eye cannot see; controls which protect workers; controls of temperature; smoke eliminators; intruder alarms; automatic controls for whole batteries of machines.

In its October progress report on American industry, the War Production Board points out that the radio business is *five* times greater than a year ago. From 20 million dollars a month last fall, it has increased to well over 100 million dollars a month. Unfilled war orders are in excess of 4 billion dollars.

From such vast growth will emerge a new engineering of products which will immeasurably improve our peace-time living.

After the war broadcasting will be infinitely more satisfactory: radio receivers will perform with a new fidelity which will amaze us. Television reception will be as flawless as the motion picture. Present secret war developments will readily be convertible to peace-time devices that will improve our standard of living.

No longer will ships collide with other ships, with icebergs or the shore. No longer will trains collide and aircraft crash in flight.

Garage doors will open as we approach and automatically close themselves. Electric lights will automatically go on and off according to our wants and needs. Furnaces and boilers will be controlled and smokestacks will cease to belch wasteful smoke. Air will be made dust free and germ free. Food contamination will be checked, meat made tender.

Grade crossings will be made safe and auto traffic will be automatically controlled.

Medical science sees new wonders ahead. Already it is possible to see "whiskers" on germs, germs which heretofore had been but a blur when viewed through the strongest optical equipment available.

Today so much secret development is going on in the ultra-high-frequency field that little can be said of its great future. But, without divulging military secrets, it can be said that ply-wood is being dried electronically in minutes instead of hours. Ultra-high-frequency welding (not to be confused with flame welding controlled electronically) is being done dramatically and efficiently.

Ultra-high-frequency heating promises to revolutionize the baking industry—it may even heat our homes.

What is this miracle working tube that can see, hear, taste, feel and smell a thousand times more sensitively than was possible heretofore?

What is the electron? No one knows, not even the scientists who know how to employ it. Electrons cannot be seen or felt; but if 6¼ million million million electrons are pushed through a 100-watt electric lamp per second, it will light up to full brilliance. For electric current merely is a mass movement of electrons. Each electron carries its share of electricity, and since the electron has so little weight it can be moved easily and quickly. Therefore, electricity transported by electrons can be turned on or off with great ease and speed. The electron tube merely is a device that controls the flow of electricity. It is an amplifier of power which can be made to do wondrous things. The sound of a termite gnawing inside of a log can be amplified a million times . . . to a roar that can be heard over great distances.

Colors can be classified and matched to a degree not possible by any other means.

Chemical or vitamin consistency can be recognized by counting radio activity within the subject being analyzed.

There is no industry in which electronic circuits cannot be used to speed up production, to increase accuracy, to do heretofore impossible tasks of calibration and measuring.

The opportunities afforded the engineers who are developing this new "electronic age" are limitless.

* * * *

Today the electronic industry is 100% at war. It is meeting the exacting demands made upon it.

Never before was electronic equipment called upon to withstand temperatures ranging from 75 degrees below to 150 degrees above zero Fahrenheit. Never before did radios and transmitters have to withstand the shaking and abuse to which they are being subjected today.

War demands have called for much redesign, much change of materials and a new conception of operating to tolerances never dreamed of in peace-time material. As a result, electronic parts and equipment makers are building better devices.

Universities and colleges are working at top speed to produce electronic engineers, for every radio operator in a plane, every radio man in the ground forces and on ships, every man operating radar equipment or electronic control devices in ordnance . . . and there are many thousands of them . . . must be a trained technician.

The wall of military censorship is high but it is no secret that one of Britain's best weapons that keeps the Luftwaffe from exterminating London is a radio locator, a device that gives alarm of approaching planes long before they can be seen with telescopes. Scanning the horizon constantly the locator warns of the enemy's approach. In the nose of a night fighter, the locator informs pilot and gunner when the enemy is within range. Neither is it a military secret that gunfire can be controlled by electronics, and that electronics is having a big share in training our new armies.

Necessity draws a veil over the most dramatic uses of electronics in warfare, but among those who know there is nothing secret about the fact that many of today's wartime applications will revolutionize our peace-time lives. Electronics will invade every industry with totally new devices and machines. The future of the electronics industry is limited only by man's imagination.

Such is electronics, and its destiny!

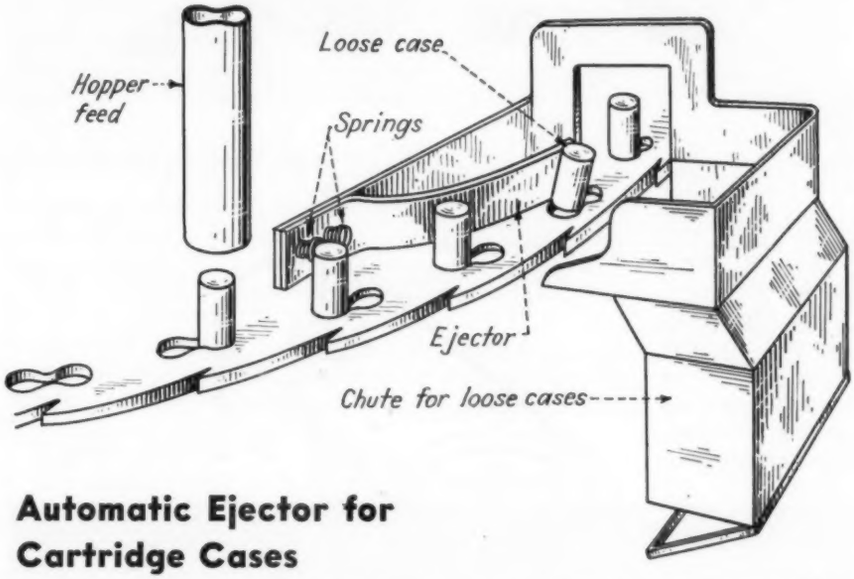
James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This is the sixth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

War Production SUGGESTIONS

The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.



Automatic Ejector for Cartridge Cases

A great saving in operator's time in an operation on 9-mm. cartridge cases was made by adding an automatic ejector to the machine. The operation forms the taper on the outside of the case and is known as "reducing." At the time the operation is performed there is a flange or head at the closed end which has been upset from the drawn shell. This flange is utilized in holding the shells in "button-hole" shaped, elongated holes in a dial into which they are fed automatically. The forward end of the hole is enlarged for the flange to pass through. The case passes backward so that the flange is then under the smaller diameter of the hole. The dial then passes the cartridge cases under the various dies, advancing one die at each stroke of the press.

Defective cartridges without heads or with small heads are mixed in with good pieces from the heading operation. These are removed at the reducing operation. Effective cases become loose on the dial, and if allowed to pass under the tools or dies, may break the dies or injure the dial. It had been the practice to have the operator in continual attendance on one machine to remove these loose cartridges and deposit them in a special box.

The device suggested automatically removes the loose cases and pushes them into a chute, from which they fall into a box. It consists essentially of a flat spring held on a suitable bracket to the left of the dial holes, the spring acting as a brush-off. When no cases are in the dial it extends to the right over the outside edge of the dial and almost over the chute. At the point where it is attached to the bracket there are two coil springs holding the flat spring against the bracket. When cartridge cases are in the dial, the flat spring is deflected to the left by the cartridges, the deflection is partly in the flat spring, but primarily in the two coil springs.

When a cartridge is tightly held it passes off the end of the flat spring, the stored energy is released and the spring strikes the next cartridge with sufficient force to jar it loose, if it is not securely held. With this device one operator can take care of two machines instead of one. In addition to freeing a number of operators for other work, there is a reduction in down time and a slight increase in production as a result. *Suggested by John Guerra, Winchester Repeating Arms Company.*

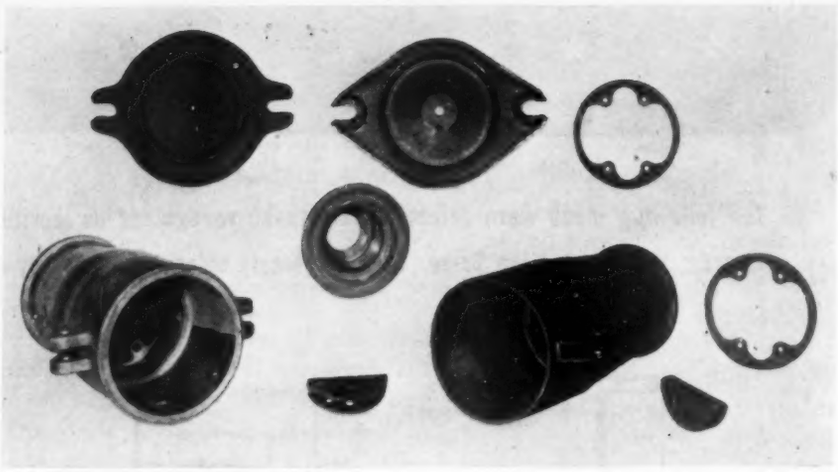
Coupler Redesign Saves Aluminum

Army searchlight cable couplers have been redesigned to replace aluminum die castings with steel tubing and stampings. The change saved over 120,000 lb. of aluminum on a single order and eliminated a serious bottleneck through transferring the job from the machine shop to the press shop. Production was stepped up 50 percent to avoid a serious delay in the schedule.

The outstanding step was to draw tubing to the desired shape, a type of draw that had not been done in this plant before and concerning which considerable doubt was expressed. One man carried the job through the critical stage of tooling and experimentation. Because of his knowledge of the flow of metal under stress he was able also to guide the design of the dies.

In addition to the coupler body change, six other details

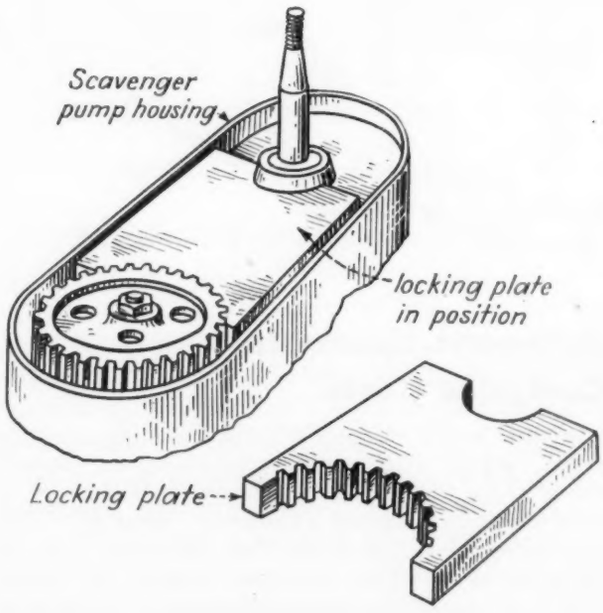
on the job were redesigned to give savings of nearly 9,000 lb. of brass rod and over 21,500 lb. of phosphor bronze. *Suggested by Walter Brown, General Electric Company.*



The die cast aluminum coupler body at the left was redesigned to use drawn and stamped parts welded together as shown at the right. Six other parts of the coupler were also redesigned, resulting in material saving up to 65 percent on each part

Two-Edged Tools

Cutting-off tools are now helping to dismember the Axis at an increased tempo by providing them with two edges. These tools are used with Cone automatics or other automatic lathes. They are made to have cutting edges both top and bottom; when one edge is worn the tool is simply inverted and used on the opposite edge. Since this method of grinding can be used on about half the cutting-off tools in this shop, there is a 25 percent saving in their consumption. Sharpening time is also reduced. *Suggested by Henry Reichelderfer, Caterpillar Tractor Company.*



Locking Plate for Assembly

In assembling the driven gear into the scavenger pump housings, it had been the practice to hold the gear by hand while the retaining nut was tightened to the proper tension. This method was awkward and tiring for the workman.

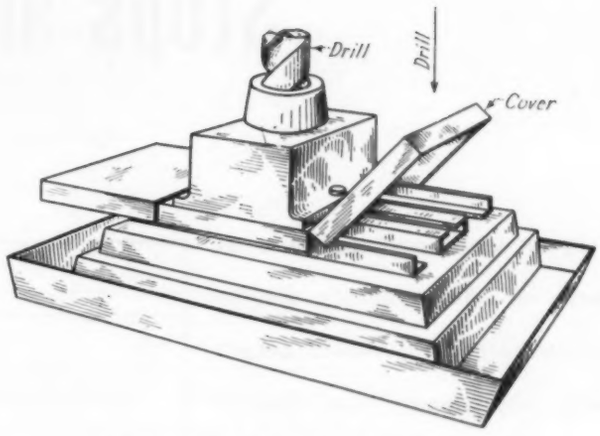
A fiber plate was developed to slip between the gear and the drive shaft boss, locking the gear positively while correct tension was given the retaining nut. After the nut was tightened, a finger could be slipped under the edge of the fiber plate, removing it from the housing. Substantial savings in production time and physical effort resulted, and more accurate adjustment of the retaining nut was possible. *Suggested by Max B. Harris, dynamometer test inspector, Aircraft Engine Div., Packard Motor Car Company.*

SUGGESTIONS

Cover for Fixture Ways

A fixture used for holding a front crankcase part for a drilling operation was mounted on slide rails. The crankcase part was mounted in the fixture and one drilling operation performed, then the fixture was moved along the rails to a position beneath a second drill. Chips collected in the slide rails and frequently prevented the fixture from moving or jammed the machine. Time was required to pry the chips out in these cases.

These difficulties not only delayed the operator, but sometimes threw the fixture off location so that the holes were drilled in the wrong place. It was suggested that covers be attached to the fixture to keep chips from getting on the rails. These covers, which are shown in the drawing, were simply made and hinged to the sides of the fixture. *Suggested by John R. Rye, Wright Aeronautical Corporation.*



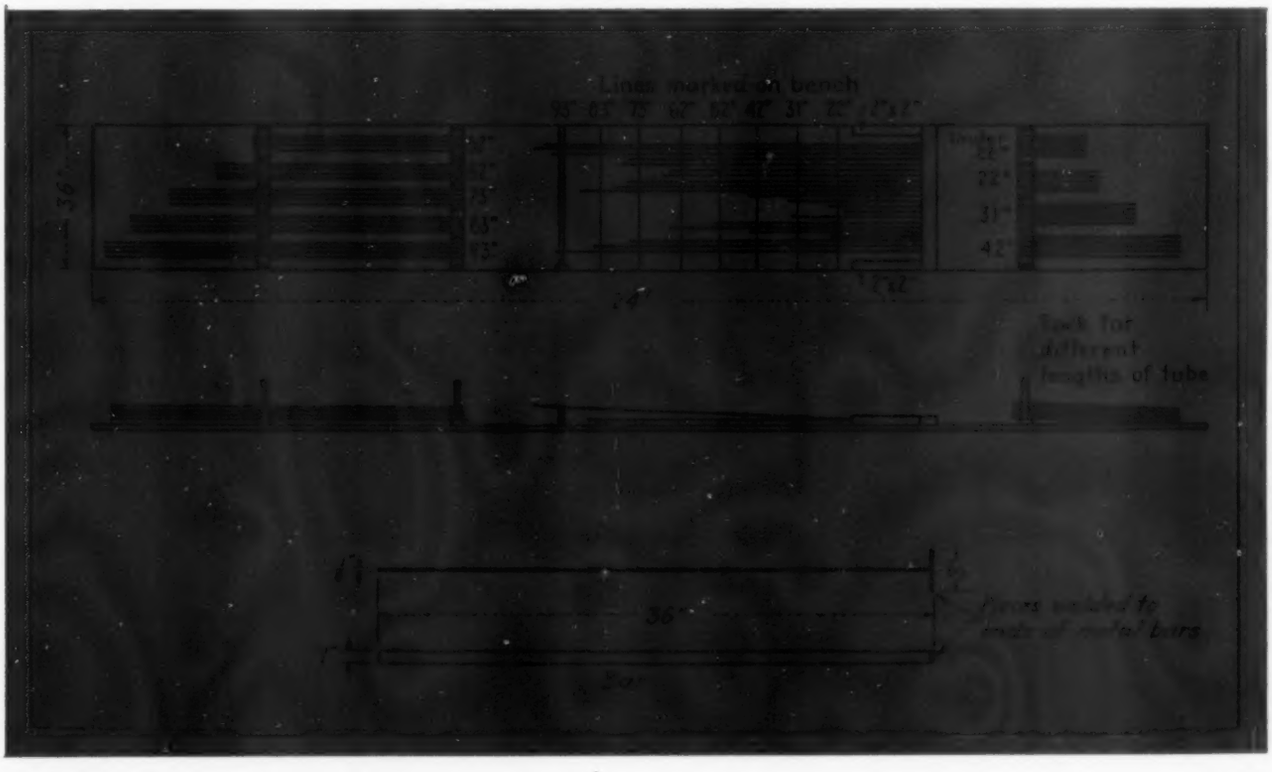
Covers keep chips from clogging rails

Table Speeds Tube Sorting

Tubes of various lengths were formerly sorted by simply measuring them and placing them in racks. A conveniently arranged table, 13 ft. wide by 24 ft. long, with racks at either end has increased the amount of material handled from 146 to 516 lb. per hour.

The table is marked off in suitable divisions; at one end a piece of 2×4 is provided to butt the ends of the tubes against. At each division a flat piece of $1\times\frac{1}{8}$-in. steel is laid with a 3-in. piece welded to the end to aid in turning it over.

The tubes to be sorted are laid over these flat strips. Then the strip at the longest or 93-in. mark is turned 90 deg. which raises all the tubes of this length or over. They are transferred to the rack provided at the end of the table, and the next strip at the 83-in. mark is rotated. In this way groups of tubes are raised successively and transferred to their respective racks. *Suggested by Andrew Caton, Wolverine Tube Division, Calumet & Hecla Consolidated Copper Company.*



Stops and Guides

BY H. R. HAGEMAN

Trigger stops and bumpers, as well as stock guides having hardened rollers, should permit easy adjustments and repairs

THE STATIONARY STRIPPER commonly used on dies for blanking strip stock should not give any trouble if the necessary stops are constructed properly. The same is true with pierce and cut-off dies, except in cases where the perforations must be held central or otherwise located within close limits. In such cases the means for centralizing should be built into the tool originally, because it is less expensive than having the work done by the maintenance department after the tool is in service.

The simplest method for centralizing strip stock is to push the stock against the back guide, usually by a spring arrangement with or without roller contact. Push-back slides can be made to force the stock back an instant before the punches enter, but otherwise leaving it free for feeding by utilizing whatever mechanism is designed for side gaging. Because of the constant friction of the stock against the back guide, that member should be made very hard, or be protected by hardened liners or rollers. The latter can be located in line with the piercing point as shown in Fig. 25; since the rollers and not the stationary guide contact the stock, compensation is made for lateral curvature of the stock. When it is necessary to centralize ribbon stock of 0.005–0.010 in. thickness, rollers should not be needed; however, they can be adapted for hard material such as spring stock by grinding clearance in the die steel as shown in Fig. 26 to prevent the stock working under the rollers.

A simple and efficient guide for centering stock of different widths is shown exaggerated in Fig. 27. The basic principle requires the stock to be pushed or pulled while feeding against diagonally opposite corners of the stock guide, which are protected against wear by pivoted rollers. Dimensions *A* are equal, as are dimensions *B*. Obviously, if another operation is to follow progressively, this method would not be satisfactory should the stock widths vary greatly. A spring-back roller may be attached at the corner indicated by the arrow to assist in holding the stock against the fixed rollers. The general rule governing the depth of the stock is one and one-half times the stock thickness, so that the final end of one strip will be pushed through by the new strip as it enters the channel. When the stock is buckled, a depth of three or four times the stock thickness may be required.

Progressive dies having stamps, countersinks or short-life punches,

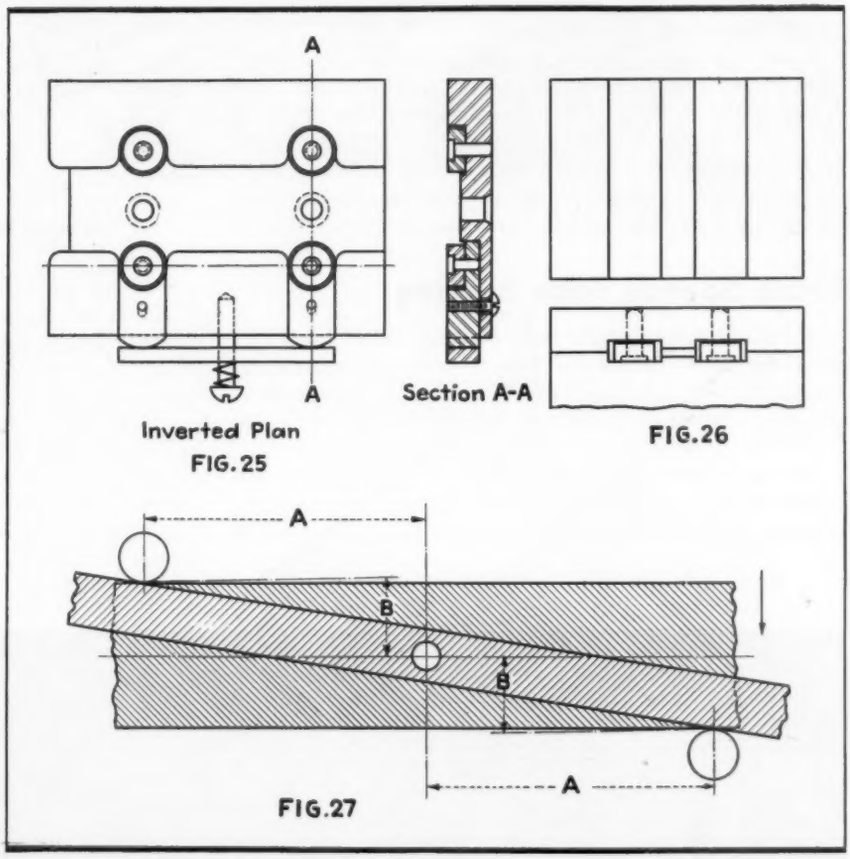


Fig. 25—Hardened rollers in stock guides protect die parts from wear, thereby reducing maintenance costs. Fig. 26—Thin stock will not work under the rollers if they are set in countersunk holes. Fig. 27—This type of guide, employing pivoted rollers, can be used for stock of different widths

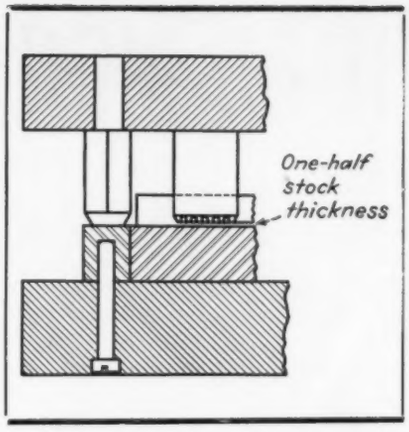


Fig. 28—When die parts limit the depth to which they can safely be closed, this type of bumper block is recommended. Adjustment is made by grinding the block each time the die is ground

which limit the depth to which the die may be closed safely, should be provided with means for preventing such members from striking the lower steel part and causing damage. Collars slipped over one or more of the guide posts are rightly in disrepute chiefly because they must be ground or faced off frequently to maintain the correct relative height. Guide bushings without shoulders have been bumped by striking on the collars, and thereby extended above the punch holder. Bumper blocks or studs which fill the space between the punch holder and die holder are no improvement, since they also require frequent adjustment and interfere with die grinding.

The solution is simple and inexpensive, as illustrated in Fig. 28. This method requires one or two blocks the same height as the die and placed close to the back edge of the steel so that they can be ground flush each time the die is ground. The blocks are fastened with screws from the bottom and are of a size suitable to take the blow of corresponding blocks or studs mounted on the punch holder. Since the lower die blocks are ground flush each time the die is ground, no re-adjustment is needed unless the relative height of the protected members is changed. Should the die parts have sufficient margin, the lower blocks may be eliminated by providing a clearance hole in the stripper, thereby permitting the upper stud to strike on the die steel. When the tool is handled with reasonable care, there should be no danger of the stud striking the steel hard enough to cause damage.

An unnecessary and wasteful condition in servicing dies is a series of stops and slides which are mounted without means for preventing their falling out when the stripper or cover plate is removed for grinding. This can be corrected easily by sweating strips of thin shim stock on each side of the channel; however, it would be better to have proper retainers designed and built as a part of the original tools. A few of these are shown in Fig. 29. A notch in the stripper to facilitate starting each strip of stock is so inexpensive to provide that it should not be omitted.

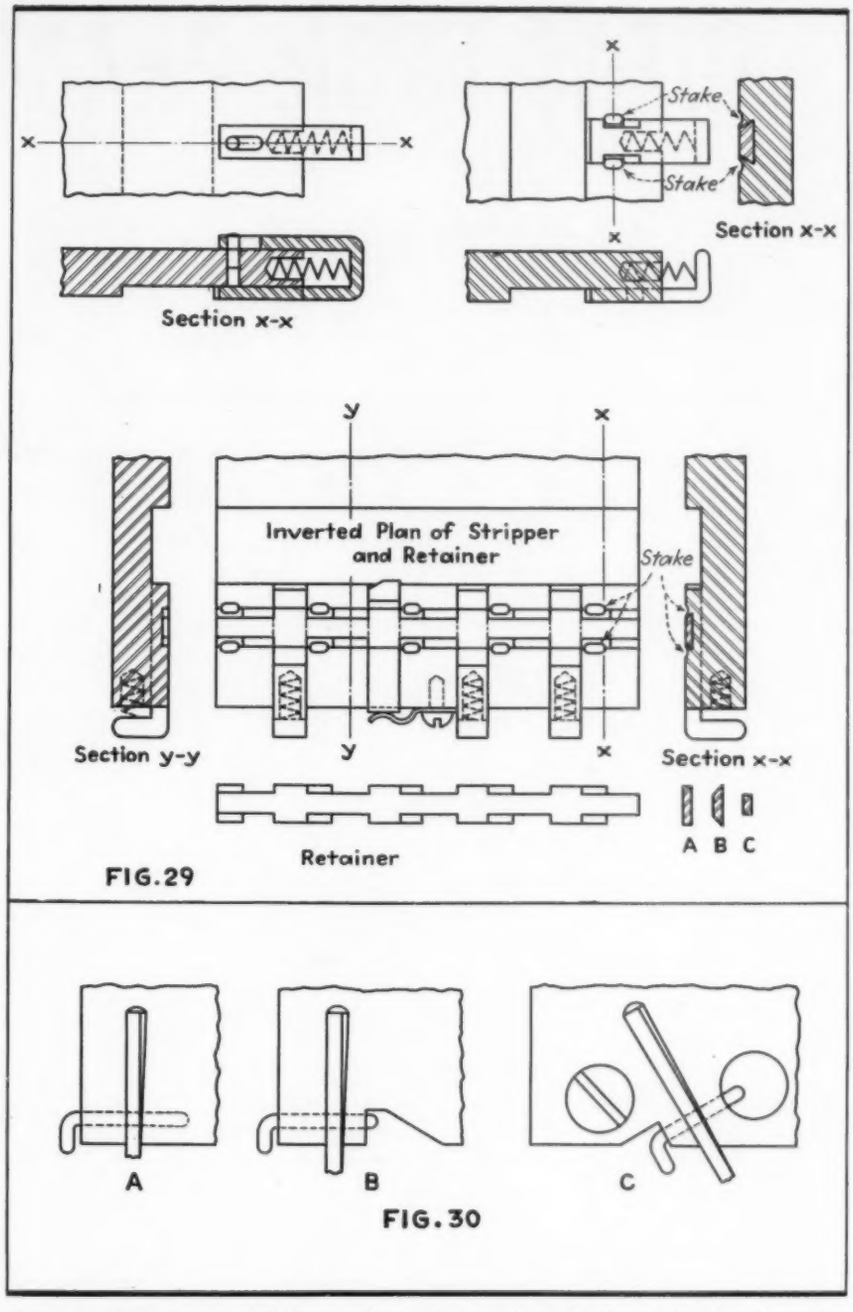


Fig. 29—Die stops and slides as shown here will not fall from the die when the stripper or cover plate is removed for grinding. Fig. 30—Trigger stops should be designed as shown at *B* and *C* for easy removal of the pivot pin

The familiar trigger stop, usually made as part of the die on which it is used, is very efficient when properly constructed. But trouble is often encountered in removing a broken pivot pin when no provision has been made for that purpose. At *A* in Fig. 30 is shown the usual construction, while at *B* and *C* are shown better methods.

This concludes Mr. Hageman's series on the "Maintenance of Press Tools."

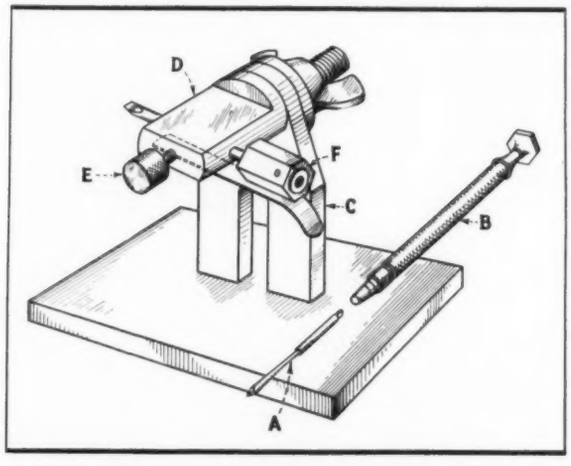
IDEAS FROM PRACTICAL MEN

Center Marker and Grinding Jig

BY AUGUST KUEHN

Sometimes it is necessary to place a center mark on work which is of delicate construction, and a center punch and hammer cannot be used. For this purpose the center mark shown in the drawing was devised.

Short length of drill rod *A* was ground to fit standard holder *B*. The three faces were ground on the end of the drill rod to form a sharp point. In order to make a center mark, the pointed drill rod is placed in the proper location on the work, and the thumb of one hand used to apply pressure to the end of the



When work is of a delicate nature such that center punches cannot be used, the center mark is useful. The pointed end of the center mark was ground in the grinding jig shown

standard holder. Since the holder is free to revolve beneath the thumb rest, the center mark can be revolved as pressure is applied until a mark of sufficient depth is produced.

The grinding jig, shown in the drawing, was originally developed for the purpose of grinding the three faces on the center mark, but has since proved useful for many small grinding jobs. Upright post *C* is attached by screws to a steel base. The work is slipped through a hole drilled in cylinder *D* mounted on the upright. This cylinder is ground on one end to form a slip fit through the hole in the upright. A portion of this small end of the cylinder is threaded to fit a wing nut which is used to hold the cylinder in position.

A flat is ground on the top of the large end of the cylinder which is parallel to the axis of the hole through which the work is slipped. The angle to be ground on the work can be set on this flat. Knurled hand screw *E* fits into the end of the cylinder and tightens against the work to keep it from turning while being ground. A piece of spring steel is attached to the bottom of the cylinder by two screws. The work is fitted on one end with hexagonal collar *F* held by a setscrew.

This jig is placed on the grinding machine table under the wheel, and the angle to be ground is set on the flat surface of the cylinder. The work is placed through the hole in the cylinder and one face is ground. The hand screw is then loosened and the hexagonal nut turned to the next position. The knurled screw is tightened and the next face is ground. The spring steel pushes against one flat on the hexagonal nut and holds it in position. Two, three, or six evenly spaced faces can be ground with this collar. Other variations are possible, using different collars.

Cutting Belts for Lacing

BY JOHN E. HYLER

In general, shop apprentices have long been instructed that great care must be used when cutting or trimming the ends of a belt for lacing, to get them absolutely square, so that the belt will be of equal length on both sides, and run true on the pulleys. Actually, there is one possible exception to cutting the ends of a belt square, and still have it run true. That consists of having the joint out of square, with one end out an amount equal to that of the other, and in the reverse direction.

This is a valuable thing to know, in case you are caught out somewhere without a square, and must lace a belt. To insure a good job, lay one end of the belt down on a wood floor or workbench, and then take the other end and give a half-over twist, and lay it down on top of the first end in perfect registration. Thus, the two belt ends will be laying face to face or back to back. Now, take a straight trim, cut directly through both ends of the belt as they lay. If your cut is a bit out of square, each end will be out the same amount in opposed directions, and the two will match up to form a perfect job.

In this connection, it is interesting to note that it has been found helpful, in the application of certain forms of lacing, for drives on high-speed grinding spindles and other places where smoothness in the drive is of great value, to apply lacing on the diagonal to a very marked degree. This involves the same principle as mentioned above, but here it is done purely for the purpose of obtaining the diagonal application. The belt lacing used consists of tightly wrapped fiber threads. The lacing imbeds into the surface of the belt, thus tending to run smoothly, and the diagonal joint passes the pulleys without any jar whatever.

In those cases where belt hooks of the hinging type,

held together with rawhide pins, are used, and where considerable lacing is done, it is better to have a little machine at hand which has been especially designed for cutting the ends of a belt perfectly square. It squares and trims the ends of a belt more perfectly than can possibly be done with an ordinary knife, having a shear-cutting blade that is operated by a hand lever or foot pedal.

Dressing Mica on Commutators

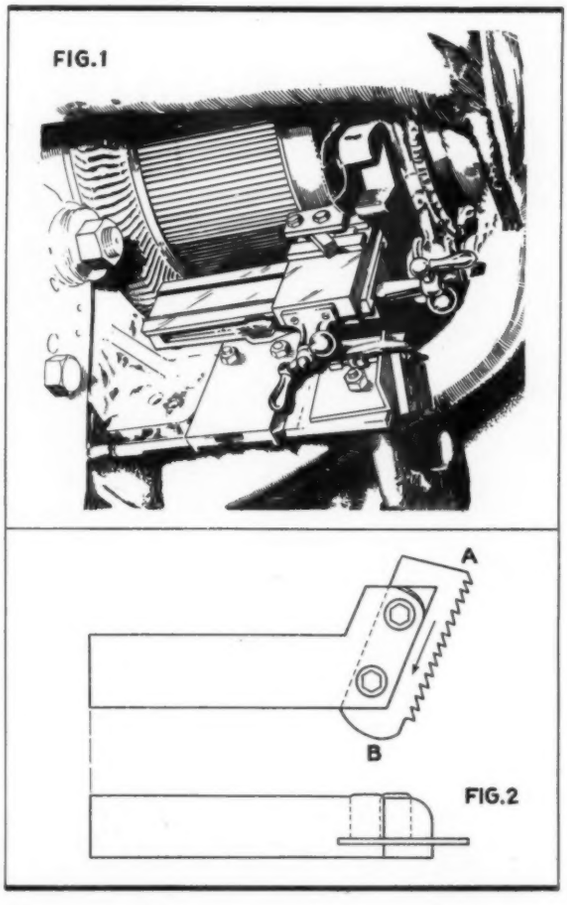
BY A. VERN KILPATRICK

It became necessary to dress the commutator on a motor-generator set and since it was done with out disassembling the machine at all it might prove practical to others in similar cases. There was no way to run the synchronous motor at other than 1,300 r.p.m.; the surface speed of the commutator was thus 3,620 ft. per min.

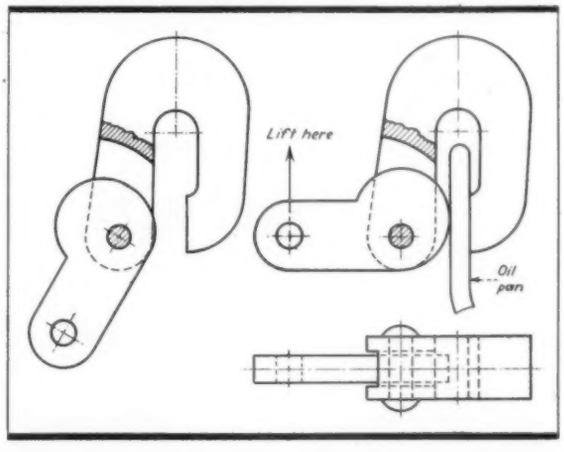
Recommended speed for tungsten carbide on copper and mica commutators is 500 to 1,000 ft. per min. The set-up for the tool slide was as shown in Fig. 1.

The $\frac{1}{2}\times\frac{1}{2}$-in. tungsten carbide tool was set in the toolholder in the inverted position and the tool was fed across the commutator at a fairly fast hand feed. After taking three light cuts the cutting edge of the bit showed no wear and the commutator was smooth with no chatter or drag evident. This indicated that tungsten carbide will stand the speed of 3,600 ft. per min. on copper and mica.

The undercutting was done with the same tool slide as set for turning but with the tool shown in Fig. 2. The hacksaw blade cutter was ground to remove the rake on sides of the teeth to 0.027 in. and set with the leading end *B* 0.020 in. higher from the axial line of the commutator bar face than the trailing end *A*. It was fed into the mica 0.020 in. deep and moved by the toolslide in the direction of the arrow from *A* to *B* cutting each slot full depth per cut similar to a broaching operation. The indexing was done by barring the commutator to the next slot from the coupling flange between the synchronous motor and generator and lining up ground end *A* with the mica in the slot by sight. The entire operation took about one day of shut-down with no disassembly.



The commutator on a motor-generator set was dressed without a teardown by using the tool slide shown in Fig. 1



This clamp can be used for lifting lathes under construction by gripping the edges of the oil pan

Clamp for Lifting Machines

When lathes made at the Warner & Swasey Company are completed, they have three large eye bolts for lifting a machine. While the work is in progress, however, some other method of lifting must be used.

The clamp shown in the drawing was designed for lifting the machine by the oil pan. Four clamps are used, two on each side. The clamp is made in the form of a U with a simple cam lever riveted to one side. The clamp is slipped over the edge of the oil pan and the lifting chain fastened to the end of the lever.

The clamps are cut from boiler plate and hardened. The same type clamp can be used for all sizes of oil pans.

Leveler Holds Turbine Blade for Milling

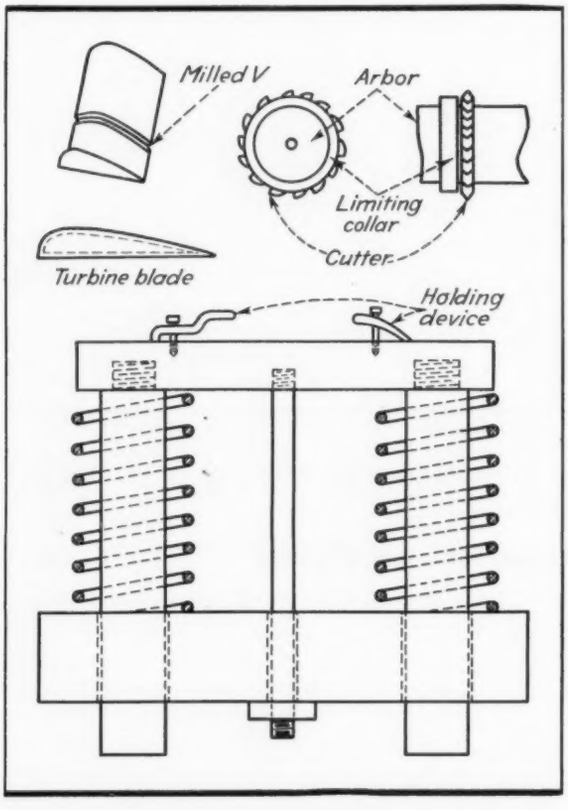
BY BEN LITZMAN

A number of turbine blades cut from the hub were to be prepared for an impact test. The blades were flat on one side, and had a long sweeping curve

on the other. One end of the blades had a shoulder. Necessary preparations for the impact test consisted of milling a V on the curved side of the turbine blade. This was to be done with a 45 deg. cutter, which had a 0.01 in. radius. The V was to be milled to a depth of 0.01 in. plus or minus 0.0005 in. A cam or any other duplicating device was out of the question because each blade had been bent in operation.

This problem was solved by mounting the turbine blade in a device which we called a "leveler" which was clamped in the vise of the milling machine. This device consisted of two steel plates. Pins threaded to fit into tapped holes in one of the plates were free to slide in bushings in the other plate. Compression springs around the two outside pins pulled the plates apart. The third pin in the center was also tapped on the lower end and fitted with a nut to hold the two plates together.

A bronze collar was mounted adjacent to the milling cutter to serve as a guide. With the turbine blade mounted in the leveler and fed by hand through the cutter, the upper plate would rise and fall to correspond with the curved and bent surface. The compression springs held the turbine blades against the limiting collar. Proper care has to be exercised in selecting the springs; for example, extremely stiff springs would prevent the cutter from following the contour of the blade.



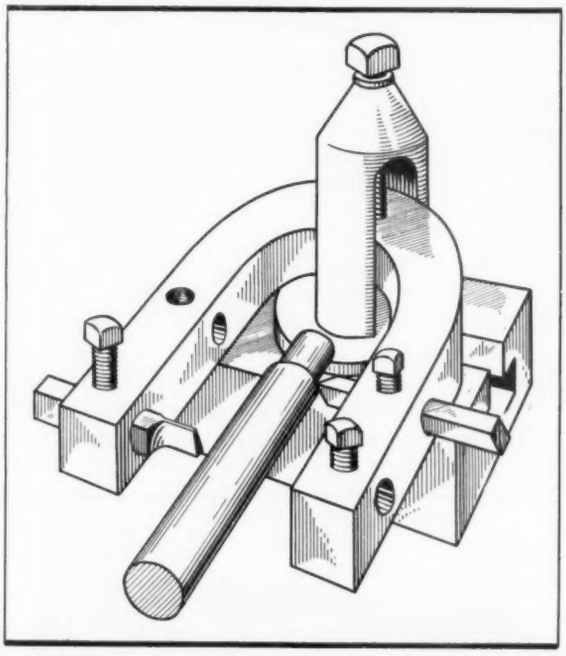
Two plates held apart by compression springs serve as a holding device for milling a groove in bent turbine blades

Compound Toolholder

BY GEORGE HOLMAN

When a number of parts must be made on an engine lathe, a multiple toolholder with tools in working position will speed up production. Simply substituting the cut-off tool for the shaping tool can be a waste of time.

A U-shaped holder, like that shown in the drawing, can be made for two to six tools from a piece of standard tool steel stock. The holes for the tools should be filed or broached square, but may be used round if care is taken in adjusting the tools. The curve of the U must be such that it will readily pass through the slot in the toolpost, or the holder can be held to the lathe carriage by clamps.



Production on an engine lathe can be speeded by using this U-shaped multiple toolholder

Stopping Chatter on Long Work

BY RALPH R. WAECH

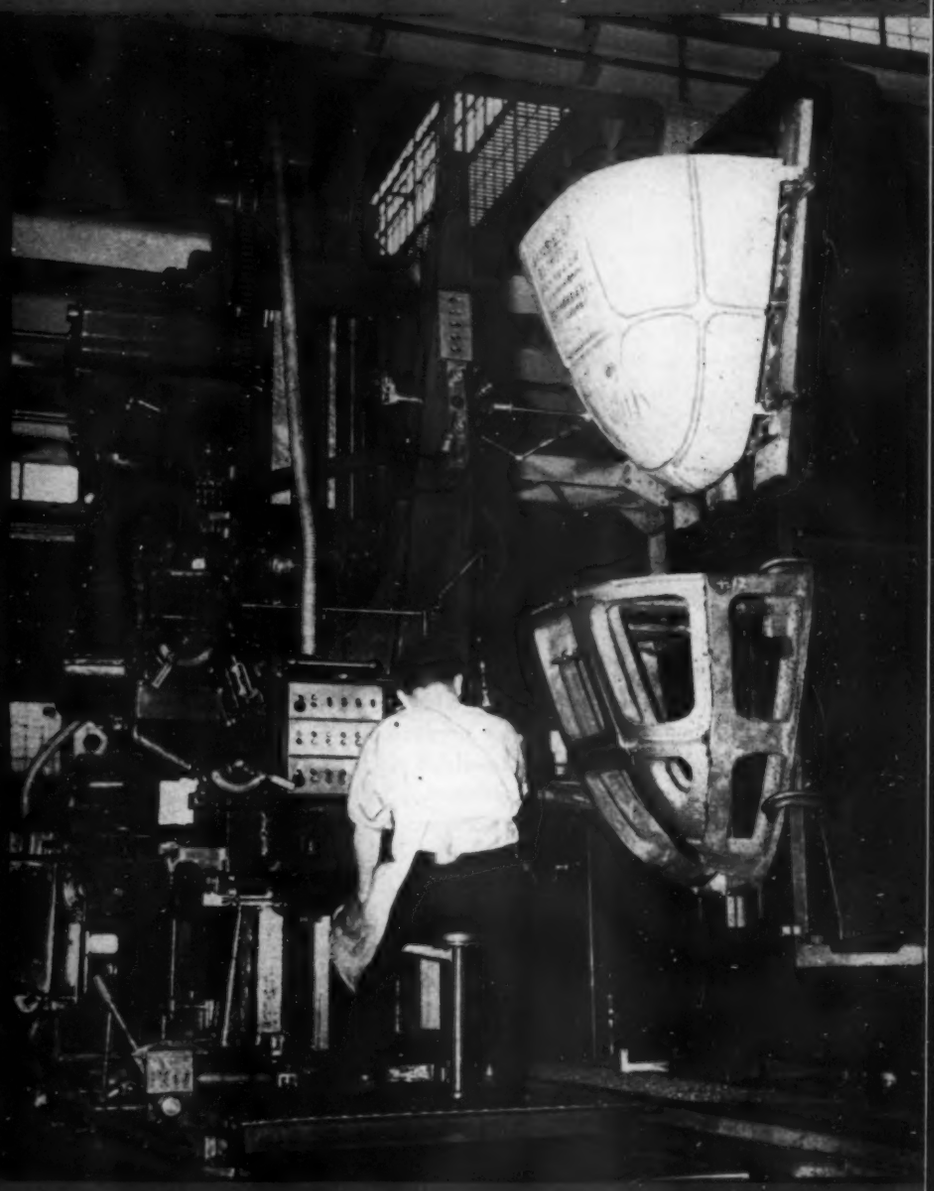
When long work is held by an overhanging follower rest, a simple way to prevent chatter is to take up the underplay between the rest and the work with a block of soft wood. The wood is placed on the carriage and can be kept snug against the work by two wedges between the carriage and the work. The slope of the wedges must of course be small to prevent the danger of slipping while the work is being machined, especially when taking heavy cuts.

These wedges tend to tip the wood in a direction opposite to the follower rollers. The block is carried along at the feed of the machine, which avoids binding.

Armament

SECTION OF AMERICAN MACHINIST

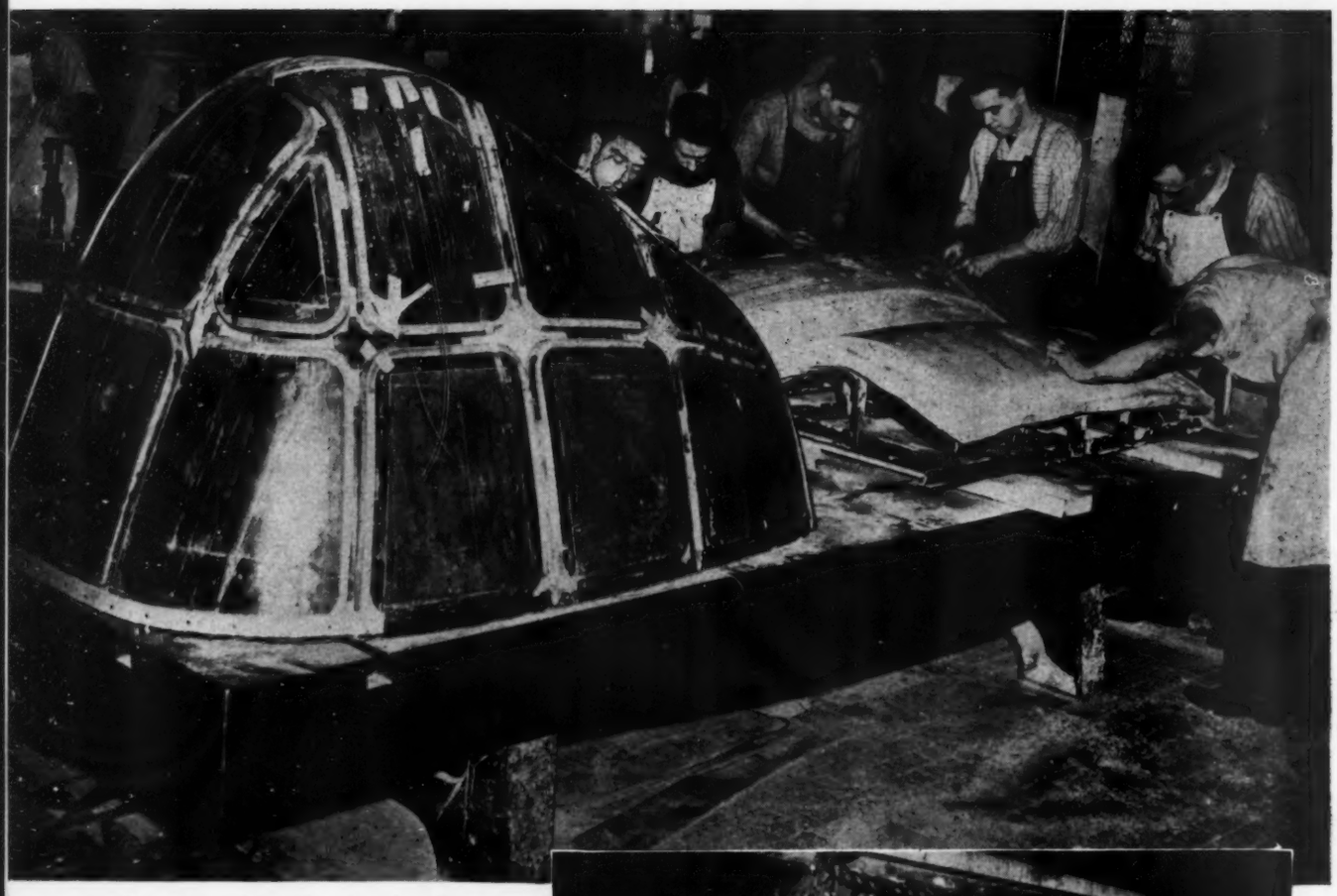
Tooling For Bombers At Willow Run



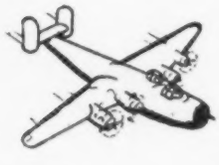
Ford's mass production technique is now being used to build the B-24 bomber. How this company's automotive experience has been applied to aircraft dies and fixtures is described for the first time in the following pages

DECISION OF THE GOVERNMENT to award a contract to the Ford Motor Company for mass-production of Consolidated B-24 four-motor bombers met with popular and industrial approval because of the well-known resources and skill of the Rouge organization.

Few people have any conception of the immense tooling job that had to be undertaken as a prelude to manufacturing operations at the Willow Run Bomber Plant. At the time Ford was brought into the bomber-procurement program, Consolidated was building the ship in 70 subassemblies to suit its manufacturing convenience on low-quantity contracts. Ford had first to learn the West Coast plane manufacturer's methods, and then adapt them to the problem of a greater monthly quota of assembled airplanes and an even larger quantity of airframes to be shipped in knocked-



Structures like the bombardier inclosure are reproduced in a mahogany master model, similar to autobody practice. Too large for a single stamping, the inclosure is divided into three pieces, and plaster female casts taken of corresponding portions of the model. These casts are then employed to produce the series of male plaster casts corresponding to the punches needed to produce a given stamping



Finishing a punch to an exact replica of the mahogany master model is facilitated by the use of a skeletonized spotting fixture, a comparatively new development in the automobile industry. The fixture, coated with red lead, is lowered onto the trim die for the pilot inclosure. Transfer of color indicates high spots to be ground

down form to other assembly areas. Questions of production quotas, final-assembly convenience, shipping and field repair of damaged war planes dictated reduction of the original 70 subassemblies to 16 fully interchangeable units. For example, the fuselage is produced in three structures, instead of a number of fuselage "skins" that are unshippable and require further subassembly fixtures at the final-assembly point or repair depot.

Production planning and tool design required several months before the tool program could be released to the Ford Tool and Die Plant and numerous venders. Although the tool-design problem was many times larger than an annual automobile model change, it was digested in a rapid, orderly manner by the development of standards akin to motor-car methods.

A year ago the Tool and Die Plant commenced its share of the original tooling program—3,000 of the more difficult dies and several hundred fixtures, some of the latter being 60 ft. long and two stories high. Eight months later, the bulk of the work was finished through night and day operation of one of the biggest and best-equipped tool and die shops in existence.

Steel Dies Used

Ford is using steel dies exclusively on bomber-parts production because its equipment and practices are so directed. The original 7,000-die program has swelled to a much higher number of tools because of design changes dictated by war use of the bomber and Ford experience with an educational order.

Definite reasons exist for the speed with which the plant has been equipped. Die standardization and procurement policies are controlling factors, but shop practices play an extensive part. Methods in use by Ford will prove helpful to other mass-production aircraft enterprises. In addition, these practices should prove of benefit to plants outside of the aviation industry in placing tool and die production on a speedy, systematized basis.

A considerable number of bomber parts must be drawn, followed by forming, embossing, trimming and piercing operations, according to piece specifications. Some of these stampings are comparatively small, such as an air duct, but sections of the bombardier's inclosure or the pilot inclosure approximate auto-body panels in size.

Ford could have developed low-production methods for this work, but chose instead to build hundreds of huge cast-steel automotive-type dies. For example, the draw die for the pilot inclosure weighs 15 tons, produces a stamping measuring 56×70 in. by 10 in. deep.

There were good reasons for the Ford decision. While more expensive than low-production "rubber" dies, Ford-built cast-steel dies are high-production tools, an advantage in an expanding bomber program. The tools take in larger sections of the work, minimizing press set-ups and reducing assembly labor. Stampings come out of the dies to exact shape and contour. Resources of the Tool and Die Plant were available to make cast-steel dies speedily. The die section of this plant is well equipped with Keller machines, planers, boring mills, try-out presses, radial drills and other paraphernalia built up to cope with annual model changes for a high-production product. Hundreds of skilled diemakers would not have to learn new tricks. And lastly, the remaining die-building resources could concentrate on the building of blanking dies and shallow forming dies.

Wooden Models Made

Production of draw dies for the bombardier-inclosure stampings followed automotive-die technique. First, a mahogany model was made in the pattern shop. Study of the model disclosed that the inclosure must be spilt into three parts, or three deep-drawn and embossed stampings. Each stamping requires a series of tools—draw dies and punches, restriking dies and trim dies. None of these can be compound tools. Some sixteen sets of dies are needed to produce the three stampings.

As a first step, the model was tilted to the punch position for each stamping, and a female plaster cast made. To the best of experience, the draw lines, drawing radii, drawing edges and trim lines were laid out on this plaster cast.

Into the female plaster model are cast male plaster patterns which are employed for foundry patterns for the punch as in the series and as Keller machine models. On a large job of this kind, a number of female and male plaster patterns are ordinarily made, representing the tools in the series, to expedite production of castings, and so that machining of the various punches and dies can be carried out as fast as machine equipment becomes available.

The wood master model has another use—the production of spotting fixtures. A skeletonized angle-iron framework is fitted with a perforated metal plate of approximately the contour of the master model. This framework is blocked up about ½ in. from the face of the mahogany model, so that a light-weight soft-metal face can be cast on the perforated metal plate, forming an exact impression of the master. The back of the perforated metal plate is covered with adhesive-coated paper, then clay and finally plaster. Gate pipes are set into the fixture so that low melting point alloy can be poured into the mold cavity so created. A tight wooden frame around the periphery of the fixture confines the liquid metal, and heavy hold-down clamps are required to keep the fixture from lifting from the hydrostatic pressure created in the mold. The alloy melts at such

low temperature that it does not harm the wood master, and it faithfully follows the contour of the smooth pattern.

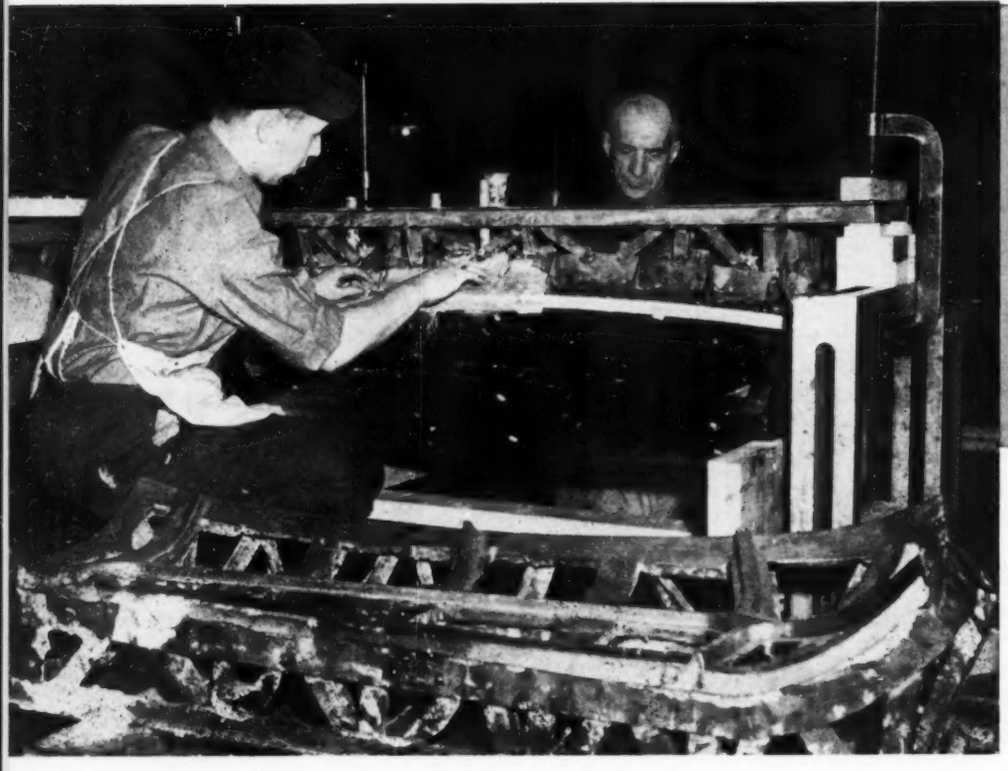
Punches are machined to a few thousandths on Keller equipment, using the plaster models mentioned. Final dressing of the punch to an exact replica of the master model is carried out with the aid of the spotting fixture. Red lead is applied to the face of the spotting fixture, which is then lowered into contact with the punch. Transfer of color indicates high spots. These are ground down with portable tools. Use of spotting fixtures cuts die-building time as much as 20 percent in man-hours and insures punch contours exactly matching the master model. Die cavities are machined on Keller equipment, using female casts of the master model, and finished by spotting the punch into the cavity.

Fender Practice Adapted

The fact that aluminum aircraft-sheet stretches approximately one-third as much as steel must be taken into account by the diemaker. In an air duct, for example, the cross-section is equivalent to a deep circular-bottom dish. In common steel-drawing practice, the entering edge of the draw die would be flat. But to avoid rupturing the aluminum blank, two kinks from fender-drawing practice are applied, Fig. 1. First, the entering edge of the die is placed 60 deg. from the horizontal to lead the metal into the die cavity. Second, the blank is preformed by hand over a wooden form so that the sides lie flat on the entering edges of the die and project about halfway down into the die cavity. Approximately $\frac{1}{4}$ in. radius is initially applied to the draw die (a little more than for an equivalent steel job) but is modified in die tryout to suit requirements. Blank-holding pressures are higher than with steel.

Criss-cross reinforcing channels in the bombardier- and pilot-inclosure stampings also present problems in avoiding excessive stretching of the metal. Design of the part "locks" the metal in the dies; hence the channels cannot be drawn in one operation without breakage. For this reason, the draw die merely forms a wider and deeper well-radiused gutter, Fig. 2, and the restriking die forms up the channel from the metal so provided. With some of these panels, the curvature is too great to restrike all portions at one shot. Successive restriking operations are therefore required, with the tools set to hold the piece at the proper angle. Hammer dies are also needed to restrike the piece after all channels have been formed, overlapping the areas struck by preceding tools and taking out any twist in the stamping.

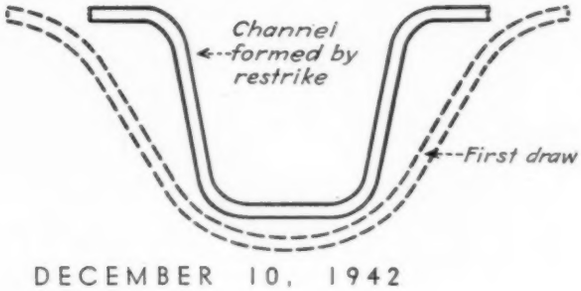
Drawn aircraft parts are produced from sheet stock ranging from 0.025 to 0.051 in. in thickness. Eighty percent of drawing operations are carried out in the Bomber Plant on hydraulic presses, because of the accuracy of cycle control. The drawing speeds are 20



Skeletonized spotting fixtures are produced by blocking a preformed perforated-metal sheet about 1 in. above the proper section of the master model, covering the back of the sheet with paper, clay and plaster, then pouring low melting-point alloy down gates to the face of the master

This piercing die for a fuselage belt frame has 58 standardized punches held in sectional retainer blocks

Fig. 2—Channels of this type cannot be drawn in one operation without breakage. The draw die forms a gutter and a restrike die forms the channel



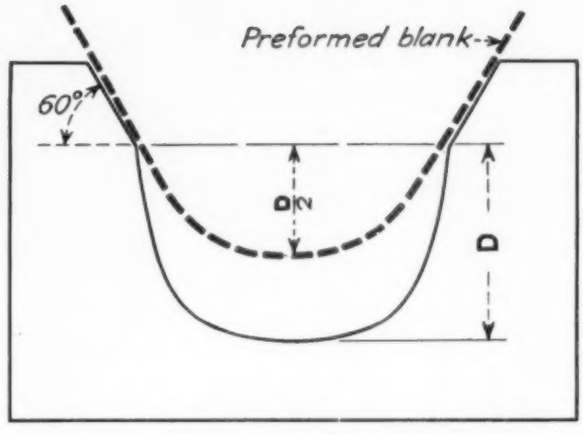


Fig. 1—To avoid rupturing the aluminum blank for an air duct, the entering edge of this die is placed at 60 deg. from the horizontal

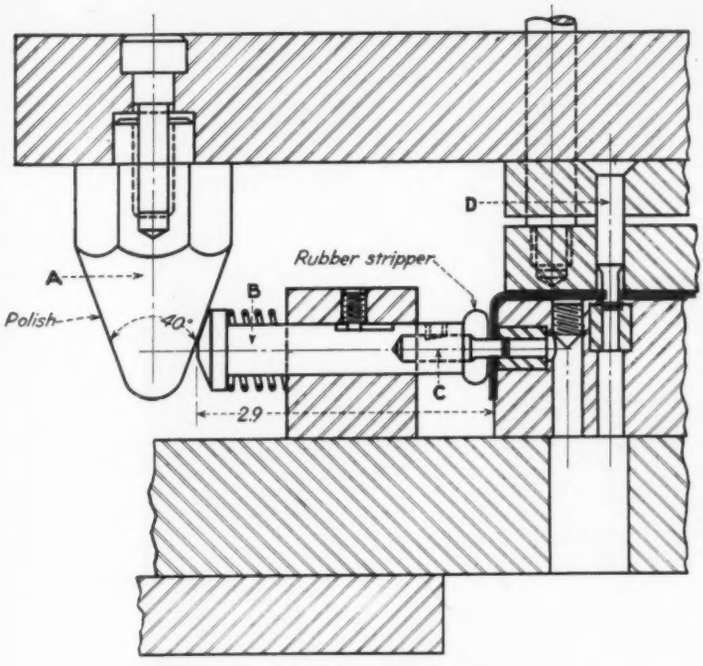


Fig. 3—Button dies are used for piercing on contours. A rubber stripper assists the spring

percent less than with steel. An important advantage of hydraulic press control is the dwell feature at the bottom of the stroke, whereby time is allowed for the metal to be firmly set in the desired shape. Springback is partially controlled by die development, and wrinkling of the stamping is avoided with beads on the drawing edges, if necessary.

Springback can be controlled by die development when shallow forming fuselage and rudder skins from ST (hard grade) aluminum alloy sheet. But for the deeper draws, such as the bombardier- and pilot-inclosure stampings, the blank material is SO (deep-drawing) stock, and springback frequently cannot be controlled by die development or respotting the tools. Trouble with springback is controlled by a procedure which allows either hydraulic or mechanical presses to be employed, and achieves results comparable to steel-stamping practice. The blank is drawn down to $\frac{1}{4}$ or $\frac{1}{2}$ in. from the bottom of the die cavity, or to the point where severe metal strain is encountered. Next the stamping is placed in an annealing furnace and given the proper heat-treatment for the material grade to restore its original properties. Then the stamping is returned to the die and finish drawn without any trouble from springback. In case the press is tied up on another part run, the annealed stamping is held in a cold chest to prevent age-hardening. In other words, heat-treating practice follows the method long used for conditioning aircraft rivets.

It has also been learned that a double-action mechanical press can be used to produce the deep-drawn leading edge of wing flaps and other control surfaces or fins. In this case the blankholding slide grips the metal tightly to prevent the slippage that may occur with mechanical skin stretchers. Annealing at proper intervals permits a much deeper-drawn part than the pilot-inclosure stampings.

A Ford contribution to aircraft-manufacturing technique is the development of standardized cam-

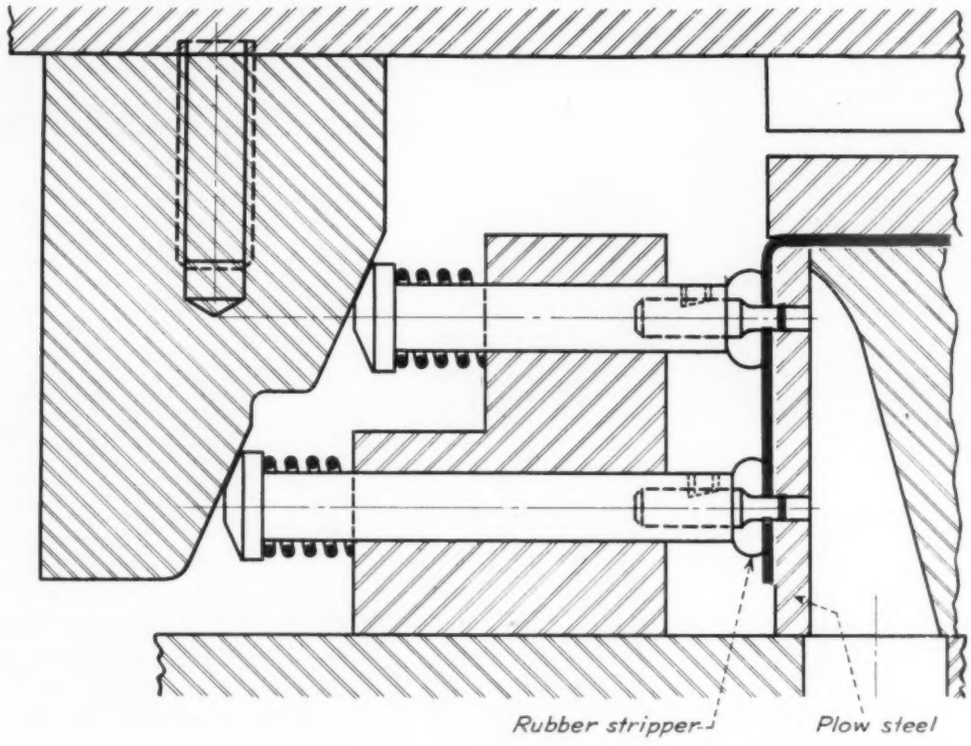


Fig. 5—To pierce holes at various heights on the flange, non-standard punch retainers are operated in one stroke by a two-step cam

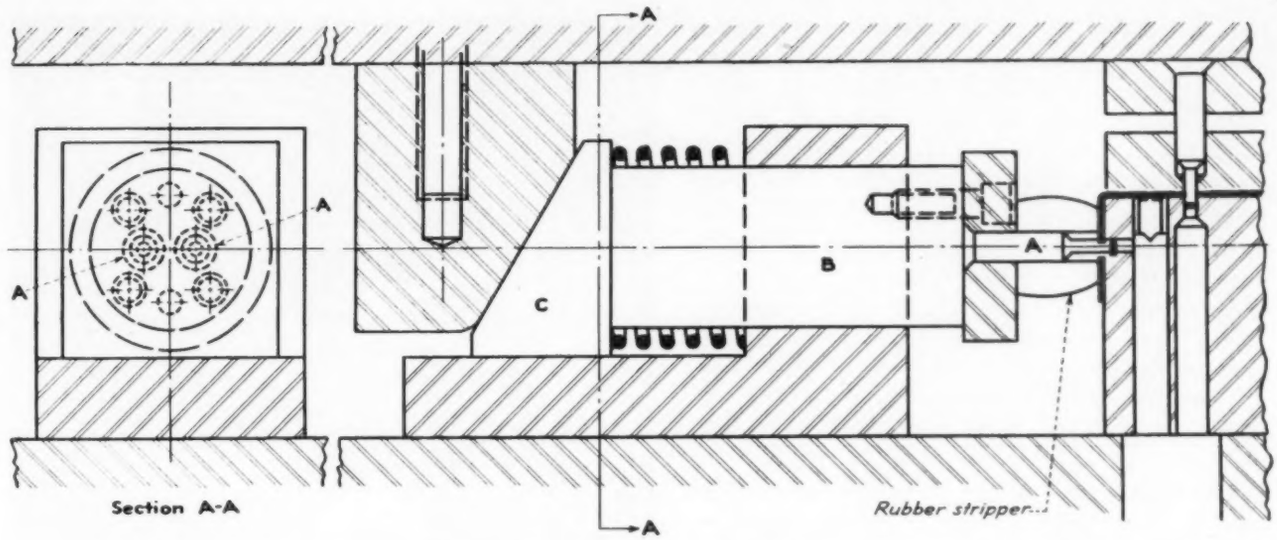


Fig. 4—When rivet holes are closer than 1-in. centers, flat-head punches are mounted in a round punch slide with a flat-bottomed heel

operated piercing punches for production of all holes in the flange of a part at one stroke of the press. Holes are pierced to 0.002 in. of templet. As many as 781 individual punches have been built into one die to pierce a single row of holes in the flange of an elliptically shaped piece.

Cam Dies Prove Useful

Cam-operated piercing punches are applied in several ways. In the most common application, Fig. 3, heat-treated driver *A* is attached to the punch-holder plate. Upon the down stroke, the driver contacts button-headed punch-holder *B*, causing punch *C* to pierce the flange. A spring under the head of the punch retainer acts to strip the punch from the piece. Cemented to the inner end of the punch retainer is a rubber stripper, to assist the spring action, especially when the material runs heavy in gage or the punch becomes dull. The driver, punch retainer, spring, and punch are standardized.

A contour cam that actuates a number of punches is used when a row of holes must be pierced around the periphery of a symmetrical part. Several punch retainers are held in sectional retainer blocks made to follow the work contour.

When rivet holes are too close together (less than 1-in. centers) for the use of this method, two fixed punches *A*, Fig. 4, are mounted in round slide *B*, which has flat-bottomed heel *C*. The same type of fixed flat-head punch is used at *D*, Fig. 3, for piercing through the flat bottom of a flanged part.

Rivet holes must also be pierced one above another in the flange of some aircraft stampings. This problem is met by mounting two non-standard punch retainers, one above the other, in a single retainer block Fig. 5. A two-step cam actuates both punches at the one stroke.

Standardization promotes the building of piercing dies rapidly. The punch holders and drivers seen in Fig. 3 are standard, being made up on bar machines. Plain and flat-head punches are standardized as to shank size and are produced on cold headers.

Scratches must be avoided in aluminum aircraft stampings, because these imperfections give rise to fatigue failure in highly stressed parts. As a consequence, punch and die surfaces must be glass smooth.

Specifications call for chromium plating the punch and die surfaces in the forming and drawing tools which made up the bulk of the program. But there are dies for which chromium plating is not applicable. Plating baths are not available for the huge cast-steel dies used for deep-drawing pilot-inclosure stampings. Long, thin die sections in some corrugating dies would presumably warp in a plating bath. Joints in chromium-plated sectional dies would not be flush. For such cases, the polishing methods of the moldmaker are added to the conventional stoning used for automotive dies. Glass smooth surfaces are produced without adding an excessive burden in percentage of total man-hours required to build the tools.

Die and punch surfaces are first hand-stoned by the common automotive method, using coarse and fine-grit rubbing blocks. Polishing procedure follows:

First polishing—cork and emery composition wheel and West alumina wheel.

Second polishing—hand-stoning with fine-grit silicon-carbide stone and Sunoco oil.

Third polishing—Buckingham white-diamond stick and 3-in. felt wheel.

In building sectional dies, forming elements are

made from Ford DBI die steel, fastened to die shoes, polished according to the first procedure above, flame-hardened, then stoned and finish-polished.

The Ford toolroom has saved many hours in production of templets for drilling clearance holes in die blocks for rivet-hole piercing punches. These rivet holes are $\frac{3}{32}$, $\frac{5}{32}$ and $\frac{1}{8}$ in. and if drilled directly in the templet, are too small to be picked up on a jig borer to discover any error in hole location.

To speed the production of drilling templets, an accurate layout is made in the lofting room and the center of each scribed hole is accurately prick-punched. The templet plate is then transferred to the toolroom, where a punch press is employed to punch $\frac{3}{8}$-in. drill bushing holes at each scribed-hole location.

The bushing hole is pierced with a combination tool. Before the press is tripped, a spring-backed pilot within the hollow piercing tool is engaged with the prick-punch mark on the templet. When the ram descends, the pilot recedes into the body of the piercer. This method produces a bushing hole that is concentric with the scribed hole if the pilot is not bent. Should any error occur in hole location, the bushing hole is large enough to be picked up by a jig borer. In using the templet the bushing is transferred from hole to hole.

A punch press is also used to rivet the Kirksite face to the steel backing plate of low-production blanking punches. Instead of hand riveting the two plates together, the rivet is inserted in the holes and headed under a punch press, giving a tight fit and a speedy assembly method. Some of these Kirksite-faced members have produced 17,000 pieces.

Tool Standards Applied

Speedy production of thousands of bomber dies is largely the result of a standardization program. Die standards are not new with the Ford Motor Company, nor with other large automobile manufacturers. But a discussion of bomber-tooling standards is in order because of the interest of non-automotive companies in the aircraft-procurement program.

In 1933, Ford established a master list of presses for auto-plant work to obtain proper gradation in tonnage and physical size of various types of presses required. Certain characteristics in press construction, especially cast-steel frames, were demanded of equipment suppliers. As a result, much of the design progress shown in modern presses has come about through the combined and cooperative efforts of Ford engineers and purchasing agents.

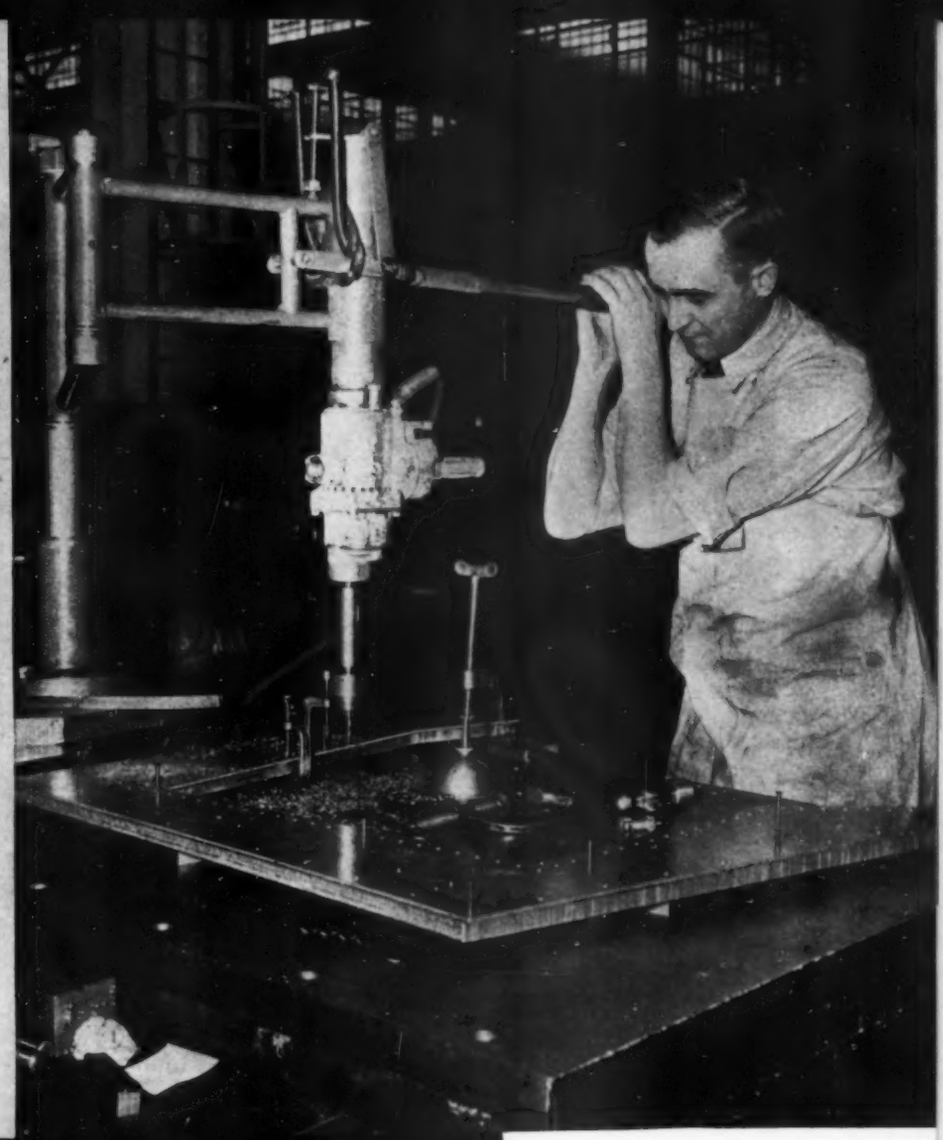
For the Bomber Plant, another master list of presses was compiled, as given in the next column.

A conversion chart was also worked out to show the die designer what size of standard die set to choose for a given blank size. Column headings give right-to-left sizes of blanks. The left-hand column lists front-to-back dimensions. For example, the designer finds that a blank 12 in. long by 6 in. wide calls for die set CB-114, which will go in an upright-adjustable 43-ton press. Because of the size of the chart only a section, Fig. 6, is reproduced. Right-to-left dimensions up to 100 in. are listed and front-to-back dimensions up to 48 in.

Punch and die standards have been worked out for blanking die sets and forming-die sets. At first, punch holders and die shoes were specified as steel plate of appropriate thickness for the size of die set involved. Scarcity of plate made it imperative to provide an optional standard thickness for semi-steel cast plates.

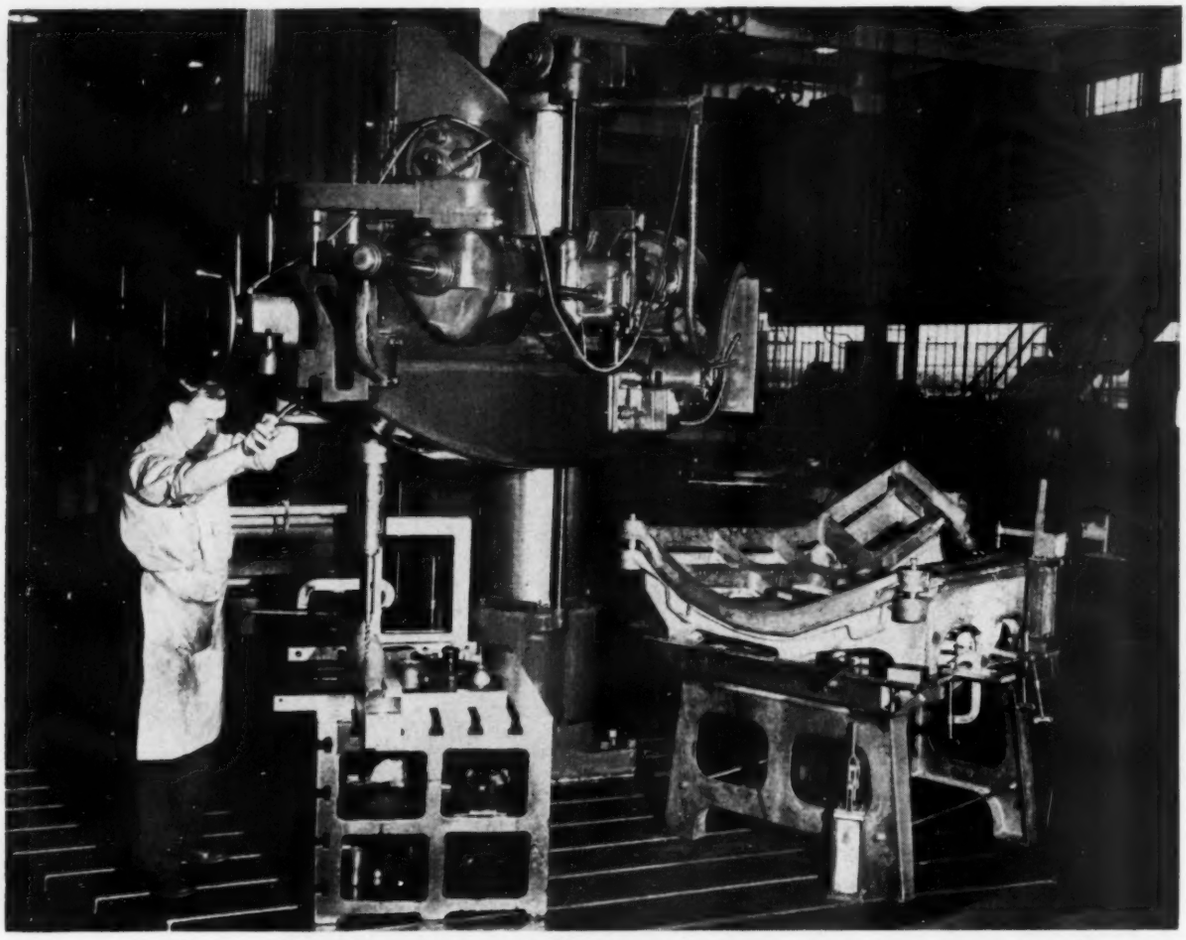
Gap-Type Size in Tons	Straight-Side R to L in inches	Double-Action R to L in inches
	36	36
25	48	48
43	66	72
56	84	120
80	108	
106	120	
	108	
	208	

First step in polishing the restrike die for the bombardier-inclosure stamping calls for the use of conventional Carborundum rubbing blocks



Output of dies and fixtures is speeded with scores of homemade drill stands fastened to the bench with a C-clamp. Most of the holes in many pieces can be drilled with the portable electric drill, and the hinged arm covers a wide area. Here the operator is drilling rivet holes through the Kirksite face and steel backing plate of a blanking punch

Finish polishing of the belt-frame flanging die follows the moldmaker's art. A felt wheel and polishing compound are used to produce a highly reflective surface. This die section would warp if plated



Ford uses half-circular surface plates under radial drills, gets at least one-third extra production from the machine because new work set-ups are made by helpers while the operator is working at another station

Fig. 6—With a conversion chart, of which this is a small section, the die designer picks a standard-size die set for given blank dimensions. Die sets are large enough to permit exceeding the charted blank dimensions by 1 in. if necessary

BLANK SIZES FOR BLANK AND PIERCE DIES

FRONT TO BACK \ RIGHT TO LEFT	4	6	8	10	12	14
2	5D CB-101 PA-2	5D CB-102 PA-2	5D CB-103 PA-2	5D CB-104 PA-2	5D CB-112 UA-43	5D CB-116 UA-43
4	5D CB-105 PA-2	5D CB-106 PA-2	5D CB-107 PA-2	5D CB-108 PA-2	5D CB-113 UA-43	5D CB-117 UA-43
6	USE 4x6	5D CB-109 PA-2	5D CB-110 PA-2	5D CB-111 PA-2	5D CB-114 UA-43	5D CB-118 UA-43
8	USE 4x8	USE 6-8	USE 8x16	USE 8x12	5D CB-115 UA-43	5D CB-119 UA-43

Two standard shut heights are therefore required, being accommodated by press adjustment.

Die sets are mounted on standard spring pads, which are permanent equipment on the ram and bolster of the press. Guide pins are used only for die-construction purposes, and to keep the components of the tools together. Punch holder and shoe of the die set have reamed locating-pin holes that match similar holes in the spring pads, or master dies. These locating pins are standardized. As a consequence, die sets can be exchanged in 10 min., and the new die need not be spotted. Some 3,000 dies will thus be used interchangeably in sixteen presses of one size, the 43-ton upright adjustable.

The dowel-pin location holes and the screw holes for fastening the punch holder and die shoe to the spring pads are standardized as to size, location and spacing. Reference to Fig. 7 will disclose that several sizes of die sets can often be used in one size of press. In some cases, die sets can be used on larger presses because the pattern of screw holes is extended in the same system of "multiples" for spacing.

This standardization of dowel-pin location holes and screw locating holes made it possible to develop two drill jigs to cope with interchangeable manufacture of punch plates and die shoes for 62 different sizes of blanking die sets. One jig, a leaf type, handles 37 sizes of plates from 8×11 in. to 21×31 in. The other takes 25 die plates from 12×36 in. to 96×188 in. An index plate fitted to either jig tells the drilling machine operator the series of holes to be drilled in a given punch plate or die shoe, which are alike. If the die set is No. 101, the corresponding dimensions, 8×11 in., are listed, and the key number of the holes to be drilled, say No. 1. The operator centers the workpiece on the jig centerline, drills the two dowel-pin locating holes, then drills through every jig bushing with No. 1 stamped adjacent, thereby producing all the screw holes in that particular piece. Jigs of this character were used by Ford and vendors to good advantage in speeding the production of standardized die-set components, and no matter when or where produced the shoes were fully interchangeable on the standard spring pads.

Standardization has been put to good account in forming dies. Locating holes and screw holes for the die shoes are produced to the same standards as for blanking dies. Punch and die blocks fitted to the die set are specified in standard thicknesses. Ford was thus able to order steel plate for itself and vendors by lots of 300-500 tons at a time. The forming elements are cut to shape on Do-All metal bandsaws, and quickly finished, eliminating a tremendous amount of end milling and profiling. The 1.8-in. thick punch section was too thick for speedy cutting to size on bandsaws, in the experience of one tool shop working on the Ford program, and the problem was met by a duplicating attachment fitted to a horizontal boring machine.

Standardization of all components in these forming dies speeded the die-building program. A 150-man die shop turned out over 20 of these dies per day.

Kirksite Used for Blanking

Kirksite blanking dies are also made in standard cross-sections. The Kirksite-face for the punch is backed up by boiler plate or cast-steel plate, whichever is available. Plow steel is specified for the die block.

These blanking dies receive square-sheared blanks, which are positioned on the die by standard spring locators, made of spring steel $\frac{1}{32}\times\frac{3}{4}\times 2\frac{1}{2}$ in. and bent to suit. Since the punch trims a scrap strip, which would fall down over the die block, a rubber stripper is provided. Spaced about $\frac{3}{16}$ in. from the die block, to avoid the cutting edge, the stripper lifts the scrap strip up to permit ready removal after the punch ascends.

Material for blanking is square sheared with suitable stock allowance for the scrap strip, being $\frac{3}{16}$ in. per side on material up to $\frac{1}{8}$ in. thick and $\frac{1}{4}$ in. over

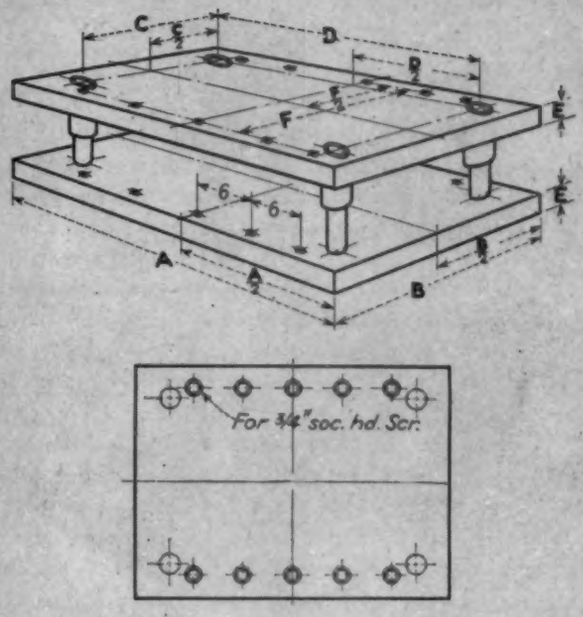


Fig. 7—Punch and die standards for die sets used with Kirksite blanking dies list the die set number, corresponding maximum blank size, size of the press and thickness of the die shoes in boiler plate or cast-steel construction

STANDARDS FOR KIRKSITE BLANKING DIES

SET	PRESS	BLANK SIZE	A	B	C	D	E		O	F
							Steel	C.I.		
201	48 Straight Side	6 x 30	36	12	On¢	31.5	0.75	1.75	1¾ Length Of Pins Not To Exceed Sh. Ht.	9
202		12 x 30		18	On¢					15
203		18 x 30		24	On¢					21
204		24 x 30		30	25.5					27
205		30 x 30		36	31.5					33
206	66 Straight Side	12 x 48	54	18	On¢	49.5	1.0	2.0		15
207		18 x 48		24	19.5					21
208		24 x 48		30	25.5					27
209		30 x 48		36	31.5					33
210	48 Straight Side	12 x 64	72	18	On¢	67.5	1.25	2.25		15
211		18 x 64		24	19.5					21
212		24 x 64		30	25.5					27
213		30 x 64		36	31.5					33
214		36 x 64		42	37.5					39
215	120 Straight Side	12 x 100	108	18	On¢	103.5	1.5	2.5		15
216		18 x 100		24	19.5					21
217		24 x 100		30	25.5					27
218		30 x 100		36	31.5					33
219		36 x 100		42	37.5					39
220		42 x 100		48	43.5					45
221		48 x 100		54	49.5					51
222	208 Straight Side	18 x 174	188	24	19.5	183.5	2.0	3.0		21
223		42 x 174		48	43.5					45
224		64 x 174		72	67.5					69
225		84 x 174		96	91.5					93

that thickness. These allowances permit proper action of the rubber stripper.

Forming dies are not complicated by integral spring-pressure pads, and no die set-up time is lost in changing springs. These advantages are secured through standardized spring pads permanently fitted to ram and bolster of the press. Pressure-pin holes are drilled in the top plate of each spring-pressure pad, according to the "multiple" selected for a given series of die sets. By multiple is meant the distance between holes, starting at the centerline. For example, with a 1½-in. multiple, rows of holes are drilled on 1½ in. centers, starting at the intersection of the horizontal and vertical centerlines of the pad. Punch plates and die shoes of the standardized die sets have pressure-pin holes drilled (where needed) on the same system of multiples, starting from the centerline. Thus, when the die set is located in the press, the pressure-pin holes in the die set and spring pads match, and the pressure pins will work freely. These pressure pins are actuated by a pressure plate in the spring pad.

Drill jigs for pressure-pin holes in die sets have also been made by Ford and some vendors, in a manner similar to the jigs for producing the dowel-pin location holes and screw holes in the punch plate and shoe.

Center Wing Fixture

Another spectacular undertaking in the Ford Tool and Die Plant is the building of the center-wing assembly fixture. It measures 60 ft. long and two stories high for two working levels, and consists of thousands of parts.

This fixture was developed to put assembly of the center wing on a mass-production basis. The center wing is a fabricated structure which is fastened on top of the fuselage, and has attachment bulkheads for the two outer wings. Main spars, or beams supporting the wing, are assembled on other fixtures, likewise detail components. Therefore, the centering assembly fixture contains permanent location devices for the end bulkheads, the intervening bulkheads, the spars, and other subassemblies. After subassemblies of the wing are located and clamped, it is necessary to drill thousands of holes for attachment of other pieces. For this reason the fixture consists of the main structure plus thousands of details—hinged drill jigs, clamps, locating devices.

Ford took the trouble to design and build these fixtures with a definite object in view—to cut assembly time and produce center-wing subassemblies upon an interchangeable basis. Under low-production conditions, the center wing had been built elsewhere in 57 days, of which 27 days were needed to erect a non-permanent fixture and 30 more days to assemble the center wing. To get the center wing out of the fixture, several hours were spent on fixture teardown, after which the device had to be rebuilt. The Ford fixture is a permanent structure, in which the center wing can be built in a few days, and removed in 30 min., by loosening clamps and rolling the top beam to one side. After the completed wing is removed, the fixture requires no adjustment and is immediately usable for assembly of the next wing.

It took three months to build the first center-wing assembly fixture. A complete angle-iron dummy was built, and the permanent location points were transferred to the drawings and shop fixtures. With make-ready established, it was easy for the Tool and Die Plant to swing into a seven-day working period per fixture. Drill jigs, clamps and locating devices were produced under repetitive manufacturing conditions, leaving the erection crew free to assemble only the fixture backbone. All elements of the fixture were produced to interchangeable limits, so that component parts would readily go together in the Bomber Plant or at other assembly plants.

The two cast-steel end-housings received jig-drilled location plates for the center-wing and bulkheads, and another location plate is placed at the center of the fixture to achieve centerline location of the spars. This plate is doweled to a cast-steel central bridge. Holes in all three plates must be within 0.002 in. of correct height from surface plates and in alignment with one another within 0.002 in. In addition, two more location plates must be placed on the fixture for the landing-gear assembly fixtures. In other words, at five points in the 60-ft. fixture, work-location points must be established to 0.002 in. limit.

Supported on Five Surface Plates

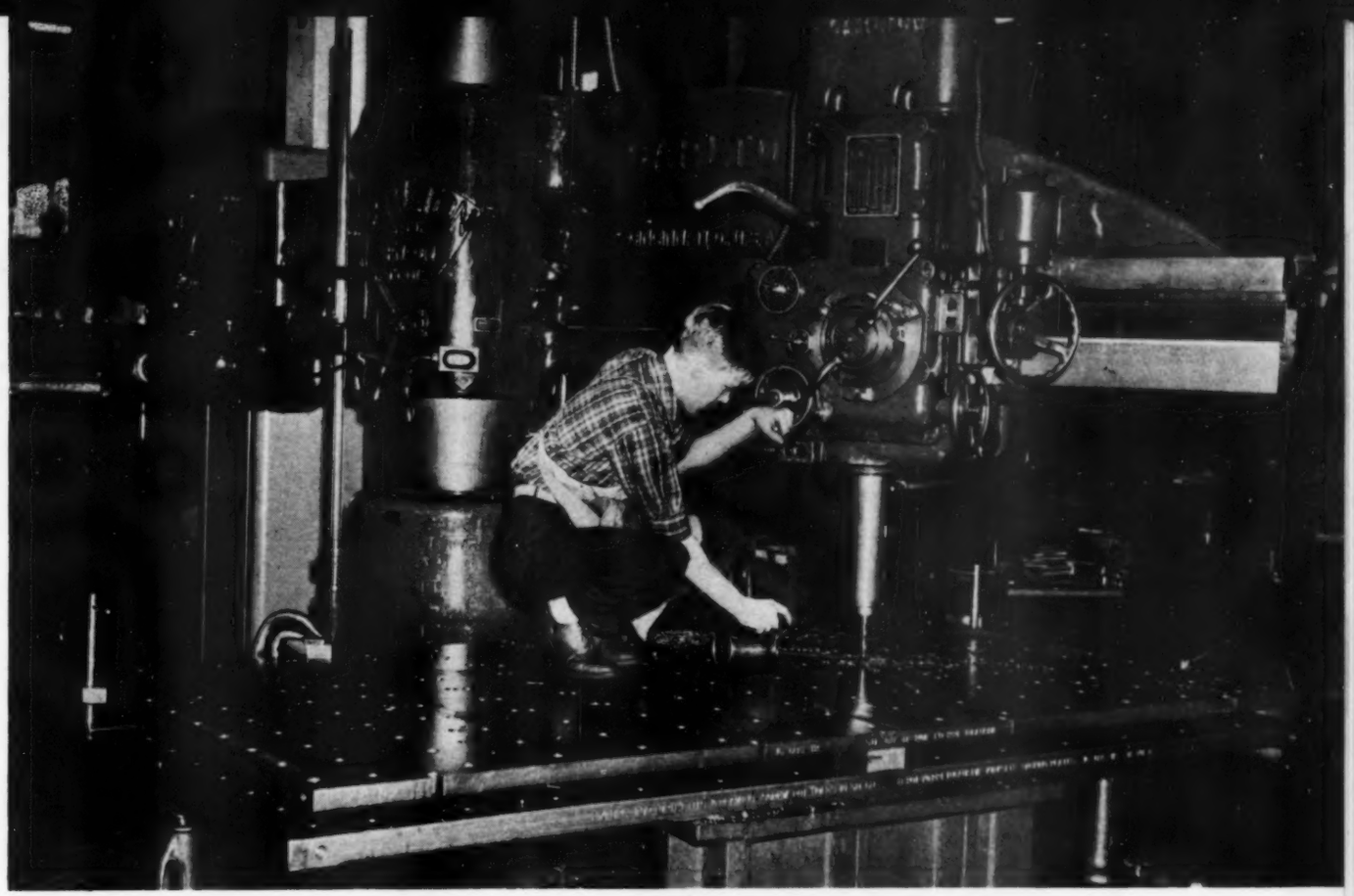
To achieve this accuracy, five surface plates were set in concrete foundations and trued dead level. Three surface plates are in line; the other two are on a parallel line.

End housings have the feet and the bottom of the jig-plate opening machined within 0.002 in. of one another. The jig plate is located within the housing opening and doweled after machining a bolster plate to fit.

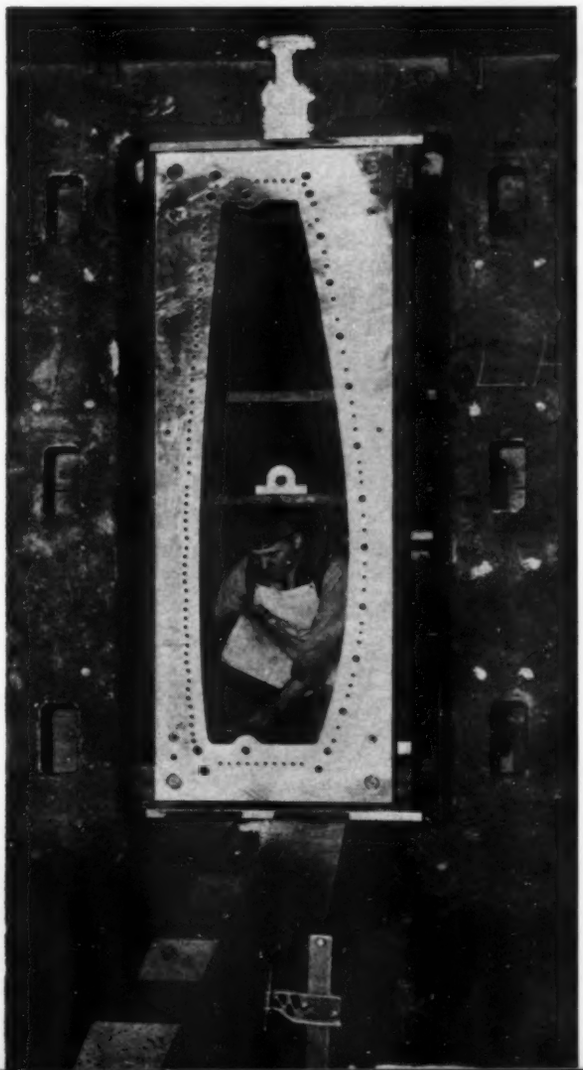
End housings are connected by welded steel beams. At the center of these beams is a cast-steel bridge which receives another jig-drilled location plate to establish center-line location of the wing spars. The bridge is a permanent fixture, having location points transferred from the angle-iron dummy.

Before doweling the jig plates in the end housings, wire chord lines are run through location holes in the center and two end location plates. Height of the holes is checked from the surface plates and alignment of the holes by transit.

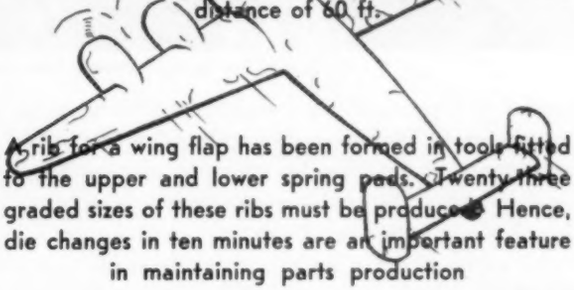
Special height gages are employed on the two rear surface plates to locate the landing-gear assembly



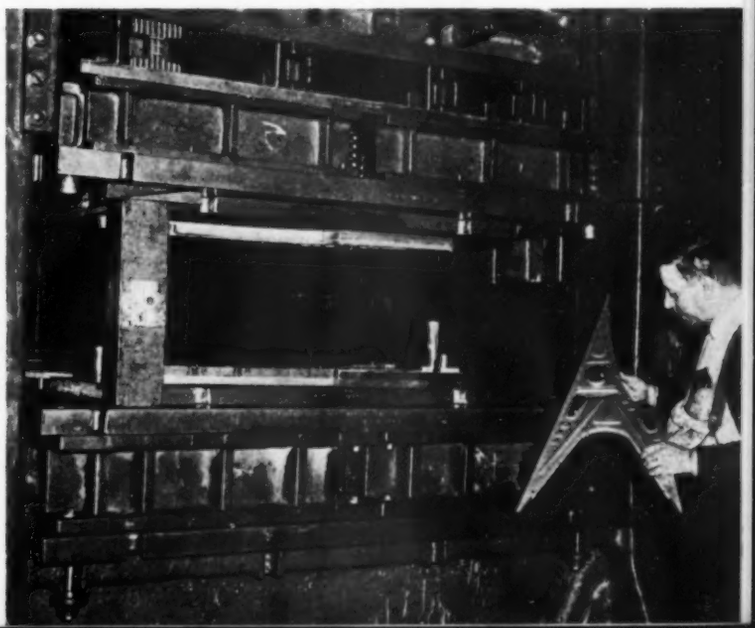
Dowel-pin and screw holes in punch holders and die shoes for 25 sizes of standardized die sets are drilled in this jig. A similar jig produces the pressure-pin holes. Upgraders and apprentices constitute 40 percent of the working force in the Ford Tool and Die Plant, increasing production and releasing journeymen for work at maximum skill



Holes in the bulkhead jig plate in each end housing must be located ±.002 in. from the erection surface plate and within 0.002 in. alignment with similar holes in the other jig plate, despite the intervening distance of 60 ft.



A rib for a wing flap has been formed in tools fitted to the upper and lower spring pads. Twenty-three graded sizes of these ribs must be produced. Hence, die changes in ten minutes are an important feature in maintaining parts production



Assembly of the wing-spar assembly fixture is speeded by standardization of locators and compound clamps, and by portable drillstands. Clamps are raised from the heavy steel fixture table to allow handroom to get under the spar

Bushings in which the retractable landing gear swivel must be positioned exactly in the center wing. Bushing-locating fixtures are assembled to the center-wing assembly fixture by the use of surface plates and special height gages. Standardized fixture elements are machined elsewhere in the Tool and Die Plant

fixtures. These height gages were also set to the angle-iron dummy. The upper moveable beam and other components of the fixture structure are machined separately, and checked upon the fixture base before shipment to the Bomber Plant.

All parts of the main structure are made exceptionally heavy, in cast or welded steel construction. By building the fixture in such manner that 0.002 in. limits are maintained throughout, any center-wing assembly is fully interchangeable, regardless of on which fixture produced. What this means in saving time in final assembly and in field repairs can be appreciated.

Spars for the center wing are fabricated I-beam structures that taper from one end to the other. Five pieces must be assembled—four special extruded angles (two of each type from the flange of the beam) and the plate that constitutes the web. A cross-section of the spar is shown in Fig. 8, which illustrates a flange-drilling fixture applied to the final assembly fixture for the center wing.

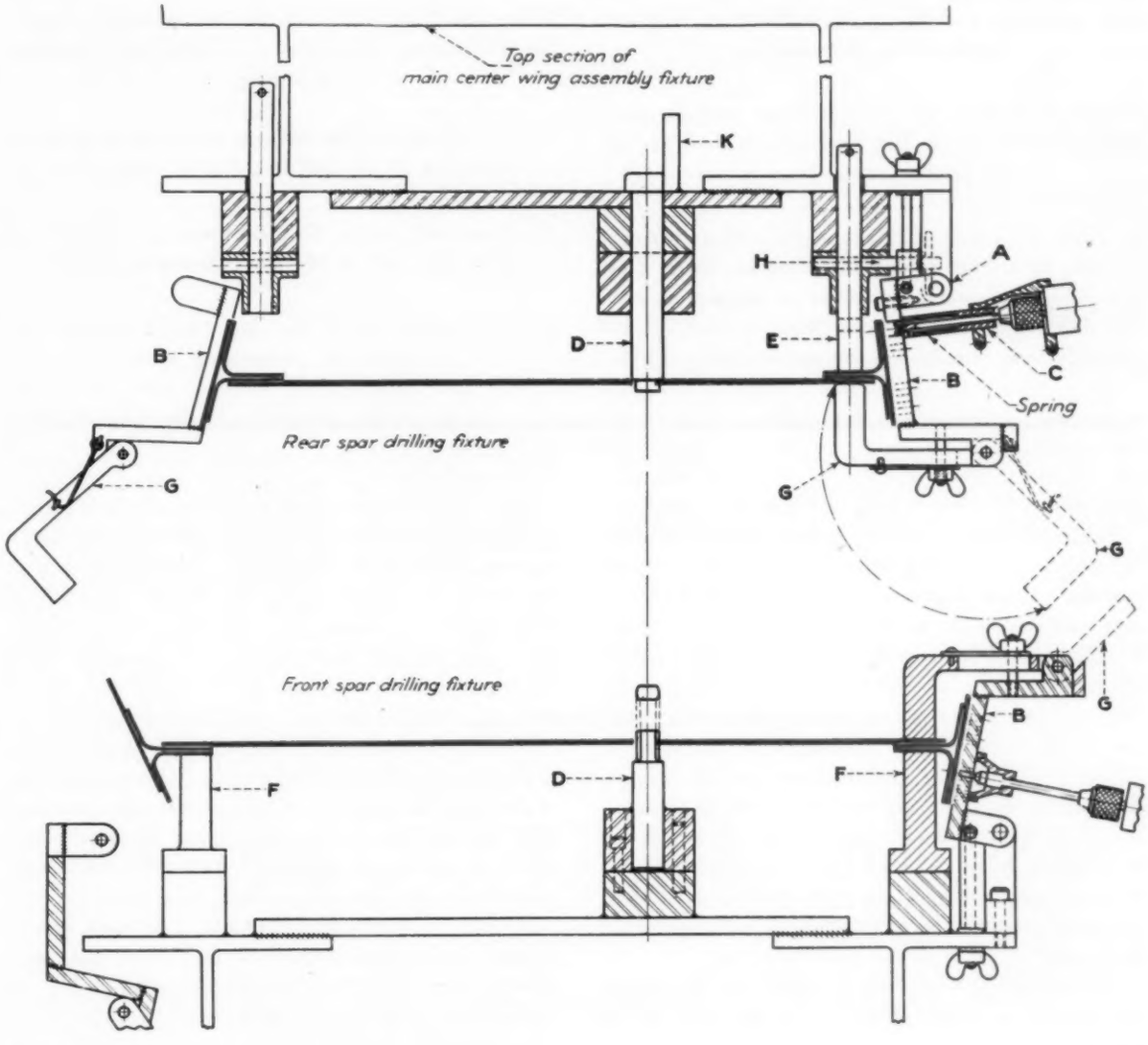
For assembling the spar, a heavy steel table is fitted with over a score of standardized combination location pads and clamps along both sides. The angular face of each locator corresponds to the angular flange on the spar. To assemble locators properly on the table, a master mahogany model of the spar is employed, against which the machined locator pads are positioned for scribing mounting holes in the table. Once the locators are positioned, the work of building the clamp portion proceeds.

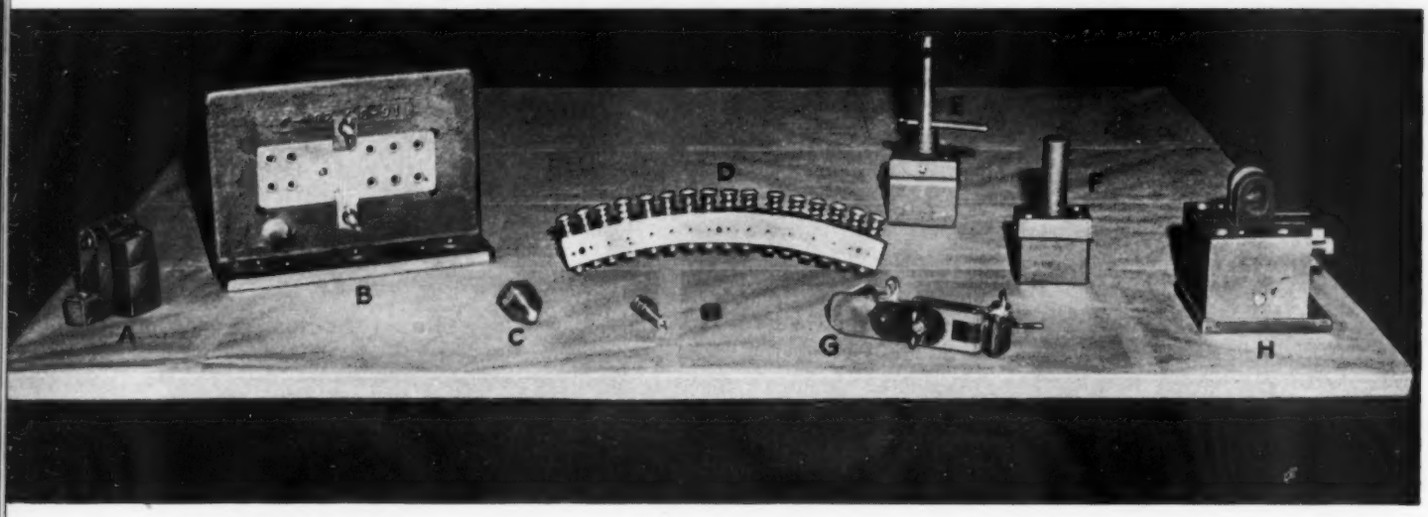
Each double-acting clamp is actuated by a lever that requires a single inward motion to actuate both the lower and upper clamps. These fiber-faced clamps draw the angles tightly against the face of the locating pad. The lower clamp is guided by a slide, while the upper one, not assembled in the accompanying photograph, has a rocking motion, being thrown from past the vertical to the horizontal position and drawn in against the upper angle of the spar. Since locator and clamp elements are standardized, they can be produced in large batches using manufacturing methods.

One of the most important aids in speedy assembly of this fixture is the use of portable drillstands shown elsewhere in connection with die work. At least five or six of these double-arm stands can be used simultaneously in building the fixture. The C-clamp allows the drillstand to be positioned where desired along the fixture.

Rear Spar Drilling

The time savings which can be effected by making fixture elements in standardized patterns is again illustrated in the case of the rear-spar drilling fixture, Fig. 8. This fixture is actually a detail of the 60-ft. center-wing assembly fixture, and is attached to the moveable top section of the main fixture. Thus, when the top section of the main fixture is unclamped and moved to one side by motors much like a crane, the rear spar drilling fixture goes with it. Then it is possible to lift the completed center wing out of the





Instead of employing toolroom methods for making repetitive fixture and die parts, Ford has standardized construction and simplified production by using bar stock, castings, and plate which are fabricated with minimum machining. Identification of these standardized items follows:

***A*—Hinge bracket for drill-jig plates used on spar-drilling fixture, Fig. 8. Two brackets are used per jig, or 104 for the center-wing fixture**

***B*—Eight drill plates of this type are used on the center wing fixture for drilling engine-mount holes. Cast bracket is permanently mounted on supporting arm. The drill plate, held by wing nuts, is used to drill assembly holes through the skin and internal reinforcements of the wing. After removal of the drill plate, a previously drilled forging is located in its stead, and the holes in the two components are reamed**

***C* and *D*—Cam and group of cam-operated punches for perforating rivet holes on contour of a flanged stamping**

***E* and *F*—Rest pins for the rear and front wing spars. There are 52 of each to a center-wing fixture**

***G*—Spar-rest clamp. One of these is required for each spar rest, or 104 per center-wing fixture**

***H*—The holder for a flap lug. Eight holders are required per center-wing fixture**

main assembly fixture with no difficulty whatever.

Before starting to build the center wing in the main fixture, the top movable section is locked in the closed position. As one of the first steps, the assembled rear spar is located and clamped in the subassembly fixture, Fig. 8. Hinged brackets *A*, incorporating drill jigs *B*, are fastened along the sub-fixture to drill holes in the rear spar at points where other center-wing parts are to be attached. For drilling, a spring pilot *C*, attached to an electric drill, engages oversize holes in the drill plate. The rear spar is located in the horizontal plane by adjustable locating pin *D*, which can be lifted up when the main fixture is to be unloaded. Vertical positioning of the rear spar is secured by adjustable rest pins *E* and clamps *G* attached to the drill plate.

When drilling is finished, clamps *G* are unfastened and hooked as shown. Prior to rolling back the top section of the center wing fixture it is the work of only a few minutes to put the adjustable locating pin *D* and rest pins *E* in the up position so that they will clear the flanges of the rear spar. Pin *D* has a half round head, which rests upon support *K*, after lifting the pin and giving it a half turn. Cross pin *H* is pulled out of the upper hole through rest pin *E*, the latter is lifted, and the cross pin inserted in the lower hole.

A front spar drilling fixture is located in the lower, and stationary, section of the main fixture. Since the center wing is lifted out of the fixture upon completion, the rest pins in this case are not adjustable, but the drill jigs are of practically identical construction as used for the rear spar drilling fixture. Obviously with many hundreds of such details to be made, standardized design has saved much fabricating time and allowed the use of apprentices instead of tieing up more experienced men or toolmakers.

Screw Thread Gages and Gaging—I

PREPARED BY the Sectional Committee on the standardization and unification of screw threads (B1) as a supplement to Product Standard ASA B1.1-1935, American Standard ASA B1.2-1941 on Screw Thread Gages and Gaging, was approved by the American Standards Association in September, 1941, following the approval of the Society of Automotive Engineers and the American Society of Mechanical Engineers, sponsoring organizations.

DEFINITIONS

1. Terms Relating to All Screw Threads:

(a) Screw Thread. A ridge of uniform section in the form of a helix on the surface of a cylinder, or of a conical spiral on the surface of a cone.

(b) External and Internal Threads. An external thread is a thread on the outside of a member. Example: A threaded plug. An internal thread is a thread on the inside of a member. Example: A threaded hole.

These terms are here defined because of possible confusion arising from the fact that an "internal member" has an "external thread," and vice versa. For the sake of brevity an external thread is hereinafter referred to as a "screw" and an internal thread as a "nut."

(c) Major Diameter, D. The largest diameter of the thread of the screw or nut. The term "major diameter" replaces the term "outside diameter" as applied to the thread of a screw and also the term "full diameter" as applied to the thread of a nut.

(d) Minor Diameter, K. The smallest diameter of the thread of the screw or nut. The term "minor diameter" replaces the term "core diameter" as applied to the thread of a screw and also the term "inside diameter" as applied to the thread of a nut.

(e) Pitch Diameter, E. On a straight screw thread, the diameter of an imaginary cylinder, the surface of which would pass through the threads at such points as to make equal the width of the threads and the width of the spaces cut by the surface of the cylinder. On a taper screw thread, the diameter, at a given distance from a reference plane, perpendicular to the axis of an imaginary cone, the surface of which would pass through the threads at such points as to make equal the width of the threads and the width of the spaces cut by the surface of the cone.

(f) Pitch, p. The distance from a point on a screw thread to a corresponding point on the next thread measured parallel to the axis. The pitch in inches

$$= \frac{1}{\text{Number of threads per inch}}$$

(g) Lead. The distance a screw thread advances axially in one turn. On a single-thread screw, the lead and pitch are identical; on a double-thread screw, the lead is twice the pitch; on a triple-thread screw, the lead is three times the pitch, etc.

(h) Angle of Thread, A. The angle included between the sides of the thread measured in an axial plane.

(i) Helix Angle, s. The angle made by the helix of the thread at the pitch diameter with a plane perpendicular to the axis.

(j) Crest. The top surface joining the two sides (flanks) of a thread.

(k) Root. The bottom surface joining the sides of two adjacent threads.

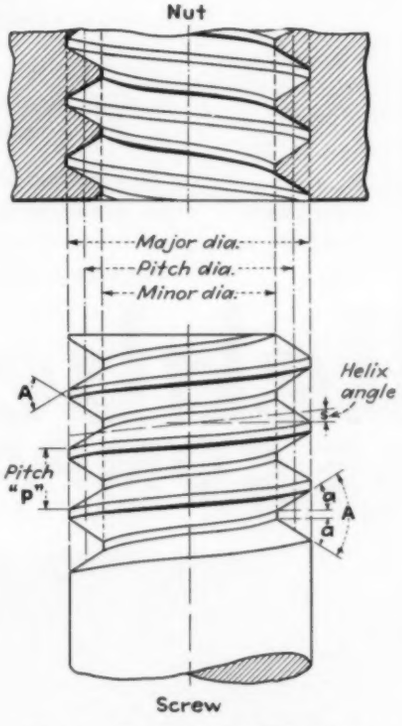


Fig. 1—Screw Thread Notation

(l) Sides or Flanks. The surface of the thread which connects the crest with the root.

(m) Axis of a Screw. The longitudinal central line through the screw.

(n) Base of Thread. The bottom section of the thread; the greatest section between two adjacent roots.

(o) Depth of Thread, h. The distance between the crest and base of the thread measured normal to the axis.

(p) Number of Threads, n. Number of threads is one inch of length.

(q) Length of Engagement. The length of contact between two mated parts, measured axially.

(r) Depth of Engagement. The depth of thread contact of two mated parts, measured radially.

(s) Pitch Line. An element of the imaginary cylinder or cone specified in definition "e."

(t) Thickness of Thread, t. The distance between the adjacent sides of a measured along or parallel to the pitch line.

Illustrations Showing Terminology. Figs. 1 and 2 illustrate the use of the terms used in the text as previously defined.

AMERICAN NATIONAL FORM

2. Specifications for American National Form of Thread:

(a) Angle of Thread. The basic angle of thread (A) between the sides of the thread measured in an axial plane is 60 deg. The line bisecting this 60-deg. angle is perpendicular to the axis of the screw thread.

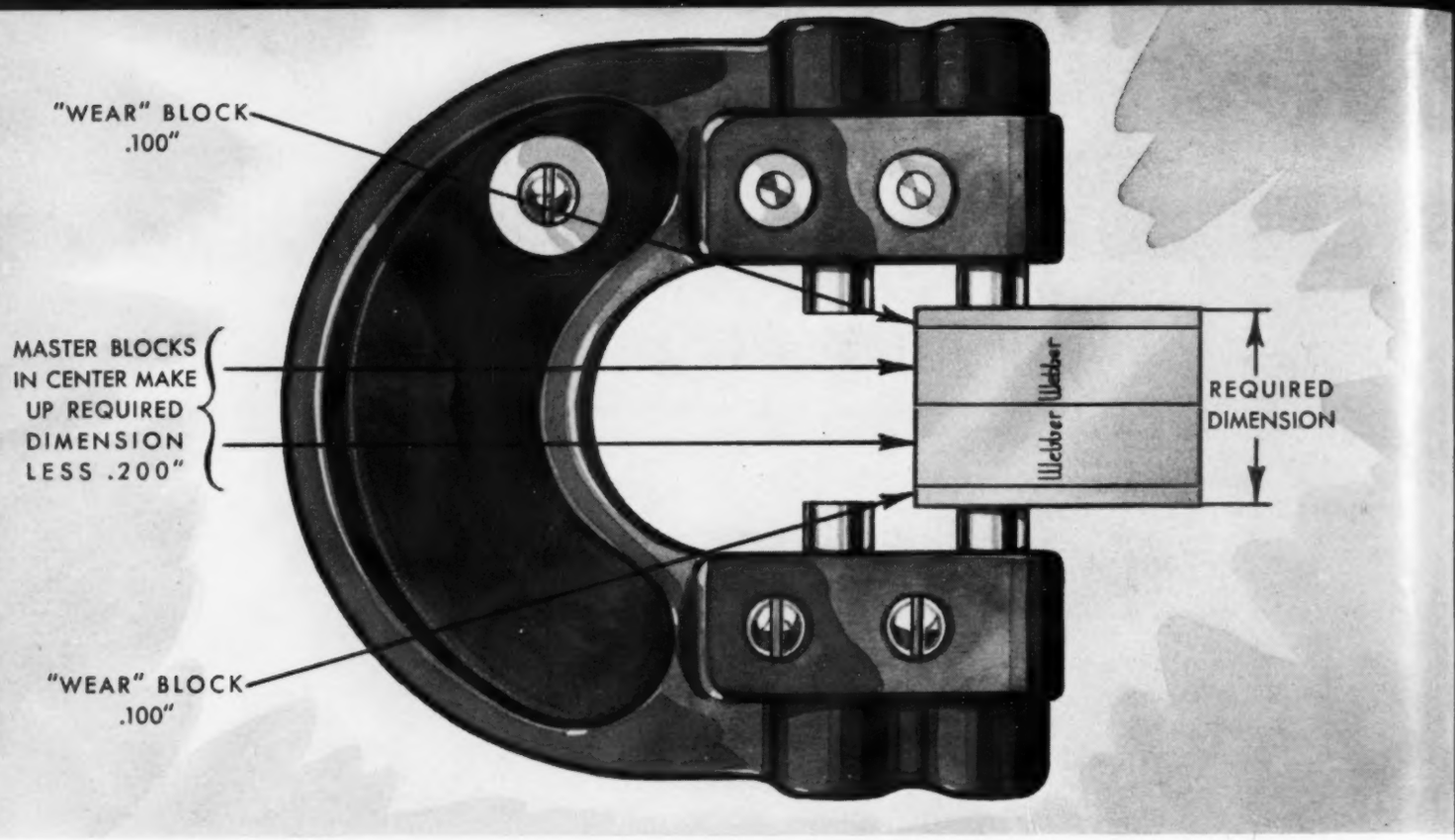
(b) Flat at Crest and Root. The flat at the root and crest of the basic thread form is $\frac{1}{8} \times p$, or $0.125 \times p$.

(c) Depth of Thread. The depth of the basic thread form is
where

$$h = 0.649519 \times p, \text{ or } h = \frac{0.649519}{n}$$

p = pitch in inches
n = number of threads per inch
h = basic depth of thread

(d) Clearance at Minor Diameter. A clearance shall be provided at the minor diameter of the nut by removing from the crest of the basic thread form an amount such as to provide a depth of thread not less than 53 to 75 percent (depending on the size), and not more



HOW TO CONSERVE GAGE BLOCKS

IN SETTING ADJUSTABLE SNAP GAGES

Use of "WEAR" Blocks prevents wear on entire set of master gage blocks.

Illustrated above is the correct method of setting a snap gage using "wear" blocks to protect the master blocks from wear and loss of accuracy.

Here's how it works: Gage blocks from the master set are wrung together to give the required dimension for the setting *less .200"*. On each side of this grouping is added a "wear" gage .100" thick bringing the total to the full required dimension.

When inserted in the snap gage all wear on the blocks due to contact with the gaging faces is imposed on the "wear" blocks and not on the master blocks.

Wring "wear" blocks to the grouping of master blocks. Always expose the same surface of "wear" blocks to the work.

When "wear" blocks wear out they can be replaced as required at a fraction of the cost of replacing master blocks.

The same system can be used where necessary to get small dimensions by using .050" "wear" blocks instead of .100" "wear" blocks.

This method of using "wear" blocks can also be applied in setting comparators, in grinding solid snap gages or in any instance where gage blocks must come into constant direct contact with the work.

Prompt delivery to firms furnishing necessary priorities. Prices for Set 81A—$350.00. Set 40A—$185.00. Write for literature.

Webber GAGE COMPANY

12901 TRISKETT RD., CLEVELAND, OHIO

WEBBER GAGE COMPANY is "all out" on production of highest quality gage blocks for war production.

Screw Thread Gages and Gaging—II

than 83⅓ percent of the basic thread depth.

(e) Clearance at Major Diameter. A clearance shall be provided at the major diameter of the nut by making the thread form such that the theoretical width of flat shall vary between $\frac{1}{8} \times p$ and $\frac{1}{24} \times p$.

3. Form of Thread (Standard):

The American National form of thread, as promulgated by the National Screw Thread Commission, is used to insure interchangeability of screw thread parts throughout the country. There are two series of standard threads, the National Coarse, abbreviated NC, and the National Fine, abbreviated NF, provided for in this system. In addition to these there are also furnished data for uniform 8, 12, and 16 pitch threads and threads of special pitches and diameters.

4. Classes of Fit:

Four ranges of tolerances designated as Classes 1, 2, 3 and 4 are provided in ASA B1.1-1935. They vary in amount from the widest, Class 1, to the narrowest, Class 4. These tolerances apply to both internal and external threads although it is not required that both members of mating parts be of the same tolerance class. It should be noted, also, that these class numbers refer only to variation in tolerance and do not denote quality in any other sense.

USE OF GAGES

5. Gaging Methods:

The manufacture and gaging of threaded products has progressed to the point where standardized methods of inspection can be formulated. From the standpoint of economy of effort, and to assure that users of screw threaded products will apply the same methods of inspection as the manufacturers, it is considered of great importance that the fundamental principles be laid down for future use. The gaging methods herein described are those which have been tested by producers and consumers of screw thread products with mutual satisfaction. A certain amount of latitude has been allowed, particularly with regard to the application of tolerances and use of "not go" gages to permit a meeting of minds between individual producers and consumers, where particular circumstances and practical applications warrant deviation from customary practice.

6. Object of Gaging.

The final results sought by gaging are to secure interchangeability, that is, the assembly of mating parts without selection or fitting of one part to another, and to insure that the product conforms to the specified dimensions within the limits of variation establishing the closest and loosest conditions of fit permissible in any given case, as provided in the foregoing specifications. This requires the use of gages representing the limit of maximum metal known as "go" gages, which control the minimum looseness or maximum tightness in the fit of mating parts, and which accordingly control interchangeability; and the use of gages representing the limit of minimum metal, known as "not go" gages, which limit the amount of looseness between mating parts, and thus control in large measure the proper functioning of the parts.

7. Use of Gages:

Gages should be used to assure production of satisfactory parts. After manufacture, gages may be used to cull out unsatisfactory parts.

8. Purpose of "Go" and "Not Go" Gages:

The "go" gages control the extent of the tolerance in the direction of the limit of maximum metal, and represent the maximum limit of the internal member and the minimum limit of the external member. To pass inspection, parts must be acceptable to proper "go" gages, and such mating parts will always assemble.

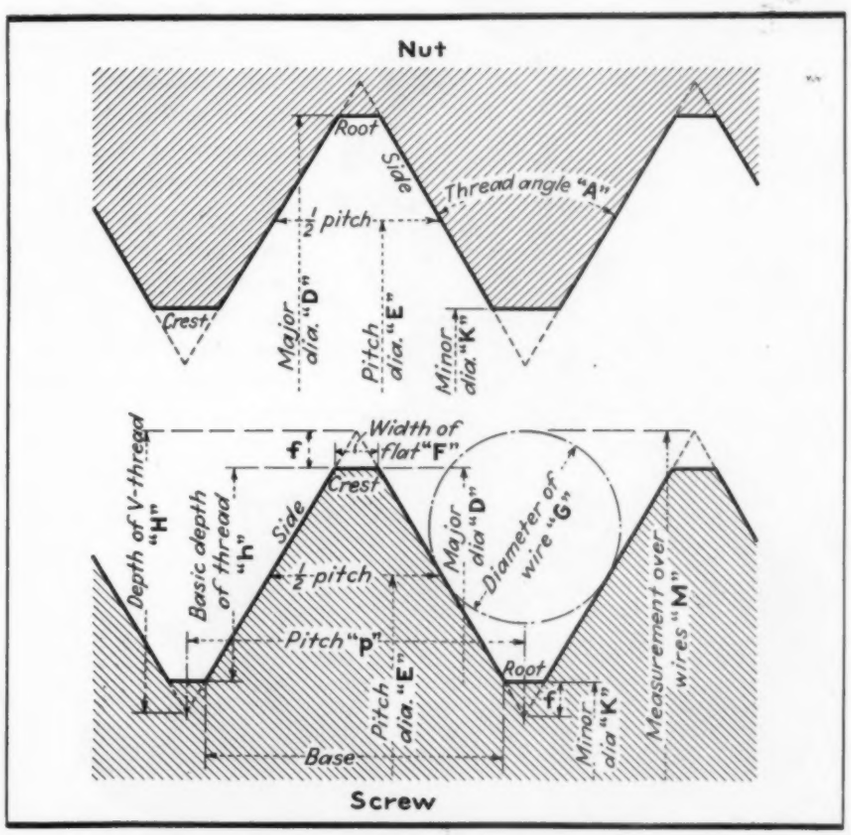


Fig. 2—Screw Thread Notation

HOW GOOD A SCRAPPER ARE YOU ?

How about taking *another* sock at the Axis—aside from the healthy punches you're delivering with war production? Round up all the iron and steel that it's not absolutely essential to keep. Do it both at the plant and at home. Then turn it in for scrap, even if some of it hurts!

In plain words, here's the picture. Steel producers are going to need several million *more* tons of scrap this year than ever before. If we don't get it, you won't get enough *new* steel; and if you're pinched, it's the boys on the fronts who will suffer. • It can be either a vicious or victorious circle. *Will you do your share—and more—to make it the latter?*

Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA

"Fluidity"—and Machine Tools

WAR IS MAKING Americans conscious of many words in the English language which heretofore have been unfamiliar.

We read daily "communiques" from the war fronts and "directives" issued by Washington officials. War experts speak glibly of the "logistics" involved in our global struggle.

Now comes a still newer term to describe certain characteristics of this war. It is "fluidity." We heard the other night a distinguished military leader talk about the "fluidity of modern warfare."

To explain that expression isn't hard. He was pointing out that war is an ever-changing rather than a static affair.

When you are on the defensive, you need certain items, such as anti-aircraft guns and shell, in enormous quantities. When a war gets into its offensive phase, the emphasis shifts to other requirements. Bombing planes and ships in which to carry men and equipment to the battlefronts are put at the top of the list.

Swift changes often are necessary in the design of weapons. Battle experience may show that a tank hasn't enough firepower or its turret is too high and too exposed. Immediately action is taken to alter the design and get the new tank into production. Witness the fact that the M-3 tank has been superseded by the M-4 and work is being done now on the M-5, each model being better than its predecessor.

A new front develops at an unanticipated center and suddenly the need arises for quantities of weapons over and above those provided for in current production schedules.

All of these factors make it apparent that in warfare it is impossible to lay down a rigid program and stick to it. The changing fortunes of war make it disastrous to try to do so. Modern warfare is a fluid affair.

Our war leaders must keep in mind this fundamental principle. It applies to our military and naval forces, and also to the industries which produce our fighting weapons.

It would be a grave error, under the circumstances, to assume without careful investigation that we have built and equipped too many new munitions plants in this country, as critics have charged. Though the immediate need for some of these plants may have lessened, they are excellent insurance in case the "fluidity" of war should bring major changes overnight.

The same kind of thinking should prevail in planning ahead the war requirements for machine tools. Some people would have machine tool production drastically slashed because we are "over the hump" in tooling up and in retooling for war manufacture. They would go so far as to have a substantial percentage of machine tool building capacity converted to production of other war goods.

In any decision about the future machine tool program, we urge the government to remember what may happen as a result of the ever-changing nature of warfare. Sudden demands are sure to arise which must be fulfilled as quickly as humanly possible.

We dare not permit ourselves to be caught unprepared for such demands. Far better to have it said that we had too much than to have hurled again at us the accusation that we had too little.

Burnham Finney

GAGING BUSINESS

Shipment of machine tools will nearly triple that of 1941. Demand is expected to continue considerably in excess of that of peacetime, though machine tool manufacturers' backlog of orders is being slowly reduced. Newly-available African raw materials begin to arrive

Tools Continue Sharp Rise Machine tool production this month is expected to reach an all-time high. The full effect of the expansion of machine tool capacity is being felt favorably and, despite difficulties in securing more manpower and in getting materials, output is being speeded in response to the request from the WPB to improve deliveries.

It appears certain that 1942 shipments of machine tools will exceed $1,300,000,000. That figure compares with $775,000,000 during 1941, or an increase of more than 73 percent. It is almost three times the volume turned out in 1940. It is estimated that machine tool production this year is over six times greater than in any peacetime year in history.

Production Is Nearing Demand As Army and Navy officials make readjustments in their production programs, some cancellations for machine tools are coming through, but new orders still are much larger than cancellations. On one point, however, there is little room for argument. The backlogs of firm orders for machine tools are steadily being whittled down. Incoming business is somewhat less than the huge volume of current shipments. In some cases the orders on hand are enough to keep builders occupied at full capacity through the first half of 1943 and even longer. By contrast many companies have no more than three or four months' business, can make deliveries of certain types and sizes of machines even sooner.

Pool orders continue to be placed by the Tools Division of WPB, but not so freely as formerly. Shipments of machine tools are going forward on schedule to Britain, Russia and other allies. The pressure to give right-of-way to orders for aircraft expansion programs is great. It is the aim to have machine tools for these programs in the hands of aircraft manufacturers by the end of the first quarter of 1943 or sooner.

Unless an unexpected change in the war occurs, the demand for machine tools will be less in 1943 than in 1942. It is too early to set down any round figures as accurate, but a good guess is that output will not be over $1,000,000,000 and may not get up to that level. The sloughing off in operations is likely to be felt most seriously late in 1943.

Demand Is High But Tapering One conclusion seems obvious. The need for machine tools will continue throughout the war far in excess of peacetime requirements. Shifts in war strategy and tooling for manufacture of improved weapons will sustain the demand for machine tools at a relatively high level. Many machines must be built to replace those worn out by round-the-clock performance the last few years. Machine tool builders realize, however, the volume ahead will not be so large as at present and in some cases are laying plans to use some of their capacity to make war products other than machine tools for the Army and Navy. A few contracts of this nature have already been negotiated.

The situation in some raw materials is easing notably. In a few materials the country has gone from the "too-little-and-too-late" stage to "enough-to-be-comfortable." In no case, however, will enough be available to do more than provide for war needs and strictly essential civilian uses.

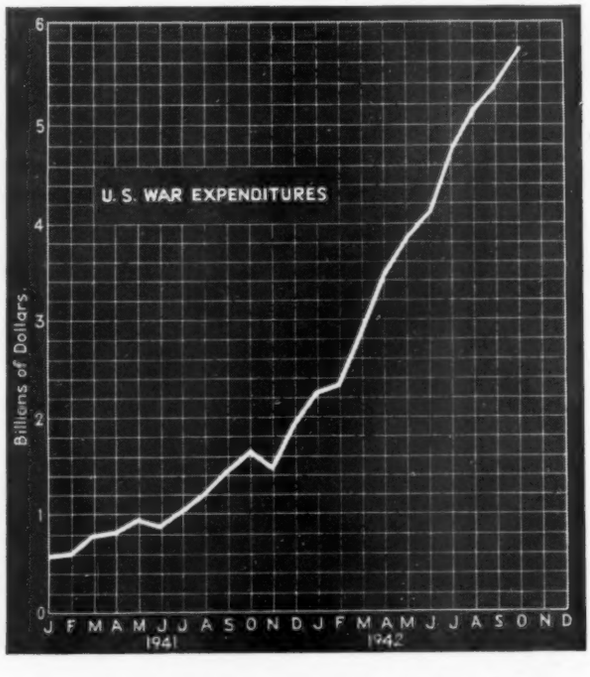
Access to big African stocks of certain materials has made available supplies that were critically required for war purposes here. These stocks are beginning to arrive in American ports and are to be followed by an increasing stream, brought back by Army transports and supply ships.

New Plants to Await Decision It is no longer a secret that a reshuffling has been made in production programs for war products. Aircraft and ships are No. 1, and tanks and guns follow. This revision has gone so far as to make it desirable to keep idle new plants only recently completed. It calls for slowing down in many factories which have been going full tilt. Much dislocation of production capacity and of labor forces is expected to result. From here on, pressure will be exerted to determine farther in advance where slowdowns must be made.

Steel ingot production continues at full speed, but talk is heard more and more around the country of a surplus of steel. This is denied officially. Bulk of the "surplus" is illusory. Preliminary rescheduling of contracts and strict scaling down of materials allotments under the fourth quarter PRP have cut down backlogs. Merely taking the brakes off production will eliminate this sort of surplus. But it's not all illusory. A shortage of capacity exists to produce special kinds of steel, such as alloys and forgings, and that fact so limits war production that it cannot absorb the full output of the simpler and more common form of steels. For a while, therefore, the prospects for steel for civilian uses are improved.

How long this condition will last is problematical. Next year the production of special steels will increase as mills under construction are completed. That will allow expansion of war production to absorb "surplus."

And Still Higher— During October war expenditures were $5,481,000,000 according to a preliminary report. Compared to September war expenditures of $5,384,000,000 October showed a rise of 1.8 percent, but September exceeded August by 3.8 percent. Total U. S. expenditures since July 1, 1940, now amount to $55,606,000,000



WPB Vice-Chairman Wilson To Conduct CMP Scheduling

At long last Wilson has a specific assignment and it is the scheduling of materials and the laying out of production facilities, after military services decide their needs

BY ROBERT COLBORN

WASHINGTON—It was weeks ago that Charles Wilson, president of General Electric, was named a vice-chairman of WPB in charge of production. But it was only this month that he or anyone else could know clearly what Wilson's job is. "Production" means a lot of things; it means expediting—cutting into specific bottlenecks and delays and straightening them out. It means procurement—placing orders for goods. And it means scheduling—setting production rates on the thousands of weapons and parts that go into the war machine so that they all come out even. In the past, WPB has done a good deal of expediting. The Army and Navy have done all the procurement. And they have done whatever scheduling was done.

Bad Scheduling Was Blamed

This situation, Wilson soon discovered didn't leave him much of a job. He decided, and Donald Nelson agreed, that he ought to have the responsibility for scheduling. They blamed bad scheduling for the poor production showing in October. And good scheduling is essential if the new Controlled Materials Plan is to work.

This decision didn't sit well with Gen. Somervel, chief of Army supply, or with assistant secretaries Patterson and Forrestall of War and Navy. They felt scheduling should continue to be a responsibility of the services. There was recrimination, soul-searching, threats of resignations. The issue went to the President. Roosevelt, finally, was able to bring the disputants together without an explosion, and Wilson got the job he wanted.

CMP Breakdown is Complex

The dimensions of Wilson's new job are best seen in terms of the workings of the Controlled Materials Plan. The determination of how many finished items—tanks, planes, etc.—the Army or Navy would like in a given time is a military one, in which Wilson's only concern is the question of technical feasibility. From that point on, comes the vital and complex job of breaking down the tank or the plane into its component parts, laying out the production facilities to handle them, setting month by month production rates on each unit, and determining the material needed to meet these schedules.

The problem then moves into Eberstadt's bailiwick, where the multitude of war and essential civilian schedules have to be reconciled with the supply of materials. The production programs come back from Eberstadt scaled down to fit supply.

Then comes the job of readjusting the reduced schedules. And after that comes the continuing job of revising schedules to meet changed conditions—economic or military.

Wilson Handles Scheduling

That, in broad outline, is the scheduling job. As to aircraft, Wilson takes direct charge of it by assuming personal control over the Aircraft Scheduling Unit at Wright Field, which has always been a WPB unit in theory though not in practice. Over scheduling of other items, Wilson will have a more indirect control. He will maintain general supervision over the operations of scheduling units set up in each procurement agency and will have to approve all schedules before they are submitted to Eberstadt's pruning.

Success of the new arrangement is entirely dependent on close and harmonious liaison between Eberstadt and Wilson. Personally, the two get along together fairly well, though with a tinge of wariness on each side. Both are strong men not afraid to reach out for power and responsibility. Donald Nelson's own biggest job in coming months will be to keep his two powerful subordinates pulling in harness.

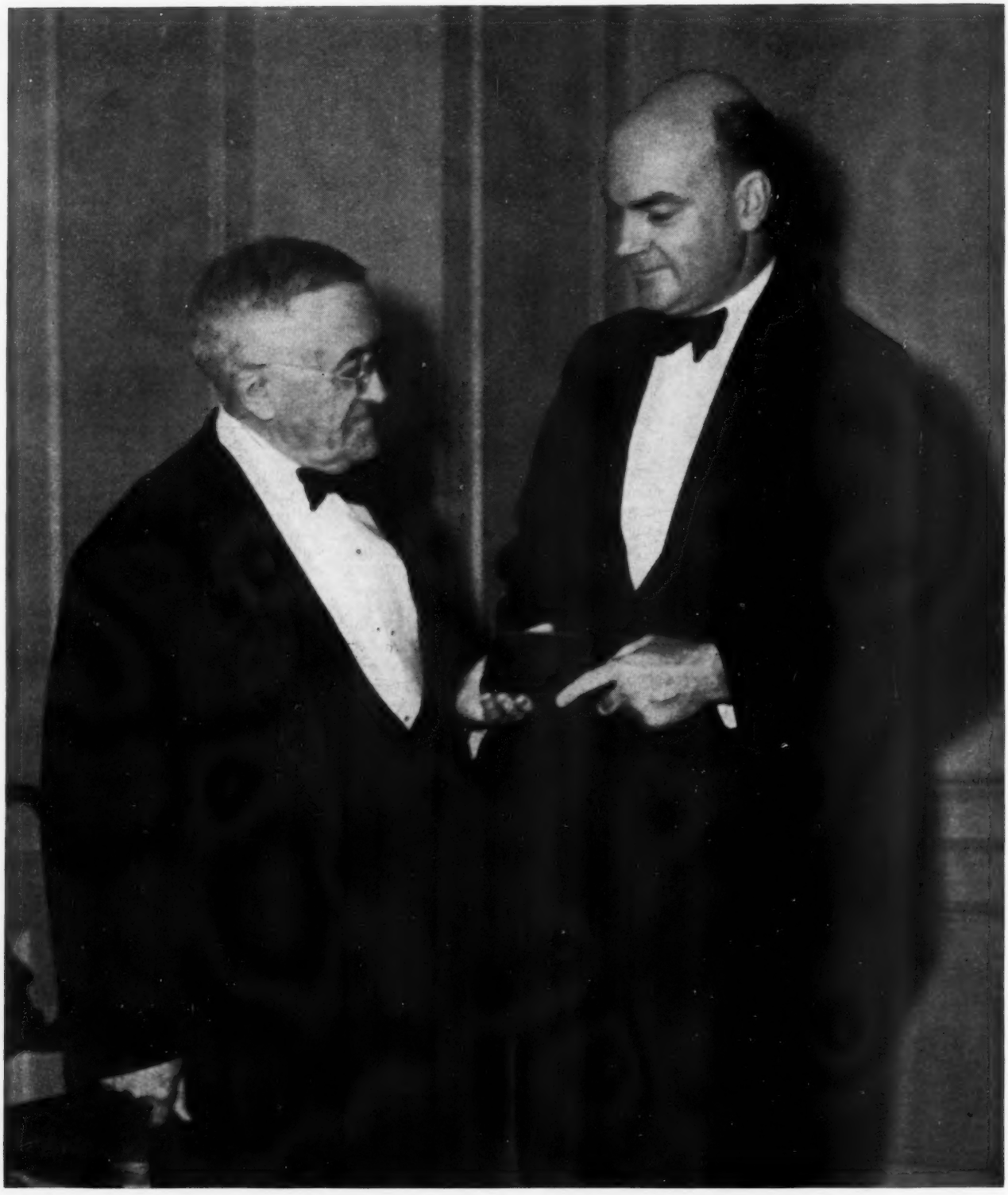
OPPOSE MILITARY CONTROL

WASHINGTON—Organized labor has thrown in with WPB officials in the fight to wrest more control away from the military. Their voluntary support was most effective in the first round of the battle. They feel very strongly that they are unwilling to entrust to the military decisions on production policies after the Army and Navy decide what and how much they must have of war goods. Frank expressions have been made by labor leaders, and under the surface they feel even more strongly.

U. S. Army

Conference Considers Tank Model—Brig. Gen. G. M. Barnes, Chief of the Technical Division, Ordnance Dept., shows a model to describe a heavy tank, at the second of a series of conferences being held by Army officials and industrial scientists, for the purpose of studying methods for improving the efficiency and effectiveness of Ordnance materiel. The original of the model weighs about 60 tons, double that of its predecessor, the M-4, due to heavier armament and armor. Its turret gun has a longer range than a field gun. Beside it is a 37 mm. cannon, probably the size of the main turret gun of the M-4. Both can be elevated for anti-aircraft use. Atop the cannon is a heavy machine gun, and beneath them are three more. Hull is rivetless cast steel. The track is protected.

L. to r. are Dr. E. C. Bain, asst. to v. pres. in charge of research, U. S. Steel Corp., Dr. F. B. Jewett, v. pres. American Telephone and Telegraph Co., Dr. W. D. Coolidge, v. pres. and research director, General Electric Co., General Barnes, R. Furrer, v. pres., A. O. Smith Corp., Dr. F. Sparre, director, E. I. duPont de Nemours & Co., C. L. Bausch, v. pres. in charge of research and engineering, Bausch & Lomb Optical Co., and Fred M. Zeder, v. chairman of the board, Chrysler Corp.



Fred H. Colvin, Editor Emeritus of American Machinist, was awarded the Worcester Reed Warner Medal at the annual A.S.M.E. meeting for "influence toward efficiency and humanity in industry" and "for his contributions to both technical advancement and improvement in management in the metal-working industries, as influenced by more than 50 years of articles and books—particularly American Machinists' Handbook." Mr. Colvin wrote his first article for American Machinist in 1886 and joined the editorial staff of the paper in 1907, retiring in 1940 after 33 years of distinguished service. He became a member of the A.S.M.E. in 1899 and a Fellow in 1941. At present, at 75 years of age, he is giving full time as technical consultant to the U. S. Navy with headquarters in Washington. James W. Parker, right, A.S.M.E. president, is making the award.

Engineers Told That Ordnance Problems Are Changing; Discuss Production Problems

NEW YORK—More than 3,000 engineers and industrialists attended the 63rd annual meeting of the American Society of Mechanical Engineers in the Hotel Astor, November 30-December 5. Major General Levin H. Campbell, Jr., Chief of Ordnance, U. S. Army, speaking at the banquet on Wednesday, stated, "The first and uppermost thought even in my mind is my responsibility to the mothers and fathers of my country to see that their sons are equipped with the finest quality of weapons which can be produced by human ingenuity. . . ." He emphasized the Ordnance Department's efforts to decentralize its activities by allocating procurement control in the thirteen ordnance districts throughout the country. Another outstanding achievement of the Ordnance Department, according to General Campbell is " . . . what we call our Industry Integrating Committees. If we have five or ten or eight firms making the same item, we weld them into one integral company for all practical purposes. These various companies set up a central committee which they themselves operate. This committee receives from each firm a record of its raw material stocks; its semi-finished and finished components; its tools, jigs, dies, fixtures; its knowledge of its personnel; and thus, the various companies in the unit act as one. This, as you can imagine, has been of the greatest value in reaching production in the very minimum of time; in the saving of machine tools and equipment; and in the correct distribution of material."

A.S.M.E. President James W. Parker in several addresses keynoted the convention with his discussion of war production and manpower problems. His address at the banquet called for nonpolitical leadership. "People believe they shall be facing a trial of their faith in self-government and for that matter a test of their beliefs regarding the very fundamentals of national life," said Mr. Parker. He declared that people are getting a better conception of their "duty to choose men of intellectual and moral capacity," and that "we can no longer afford to delegate leadership to our professionalized politicians and economists." He concluded, "The times are crying out for spiritual leadership. Upon the trained thinkers of the nation is laid the responsibility for producing that leadership."

Paul V. McNutt, chairman, War Manpower Commission, in speaking before a luncheon of the Railroad Division of the society stated: "In developing the manpower program we have placed great stress upon cooperation between management and labor. We have done so because we see the manpower problem not as a single national problem evenly distributed from area to area and industry to industry, but as a multitude of individual problems each of which has a specific solution.

"Take the matter of areas, for example—out of 227 labor market areas 66 have a present labor shortage, and 64 others have potential shortages. On the other hand 97 have a labor surplus.

"Take the matter of skills—our precise situation with reference to each particular skill is not different merely as supply relates to demand. The urgency of our need and the claims that may be made for deferment are affected also by the time that would be required to train replacements. Two years ago," Mr. McNutt stated, "there were less than 500 thousand women in war production. Today there are nearly 4 million. And before the end of next year there will be 6 million."

The meeting this year was comprised of 52 technical sessions and discussion groups at which 150 papers were presented. Harold V. Coes, vice-president, Ford, Bacon & Davis, Inc., New York, N. Y., was elected as the A.S.M.E. president for 1943.

A.S.M.E. Headliners—Pres. James W. Parker, William L. Batt, Vice-Chairman, WPB, and General Levin H. Campbell, Jr., Chief of Ordnance, U. S. Army.

At the close of Tuesday's production engineering meeting—left to right: Prof. O. S. Boston, University of Michigan, J. A. Harlan, Textile Finishing Machine Co. Pres., C. R. Alden, Ex-Cell-O Corp., A. M. Johnson, president, Barnes Drill Co., A. F. Murray, Westinghouse Electric & Manufacturing Co., Erik Ober, editor, *Machinery*, A. M. Lennie, Dow Chemical Co., Prof. W. W. Gilbert, Univ. of Michigan, Prof. Charles Tutt, Jr., Princeton University.

Plane Production Will Be Emphasized and Streamlined by "Little WPB" for Aircraft

WASHINGTON—Detail of the War Production Board's "Little WPB" for aircraft had not been worked out as this was written, but it is clear that aviation is now recognized as a major weapon, next to combat and cargo shipping.

The War Production Board has various subdivisions—tanks, ordnance, and so on, but aircraft is now singled out for special attention by a head man of the war program: C. E. Wilson, vice-chairman of WPB, former General Electric president.

The power is being turned onto aviation for two other reasons. Production of aircraft is a special problem because the technique is new. More important, strong administration is needed to stop the traditional overlap of Army and Navy air services. Duplicate production lines have been running for Army and Navy on airplanes identical except for whimsical preferences for gadgets.

The new aircraft board is made up of Maj. Gen. Oliver P. Nichols, materiel chief of the Air Force; Rear Admiral Ralph E. Davison, assistant chief of the Navy Bureau of Aeronautics; Harold Talbot, head of the old WPB aircraft section, now out of the picture; and Mr. Wilson, chairman, who has the full power of the President, delegated through Nelson. Mr. Nelson set up the new airplane board because, he said, he had at times been compelled to fight the Army and Navy representatives on the Munitions Board for right of way and increased schedules for airplanes.

Program Must Double

Nelson said, as he put Wilson at the controls, that the airplane program must be doubled next year. He declined to say what this would mean in terms of units. But you can figure it out. We are producing this year somewhere near 50,000 planes. So our program for next year is just over 100,000. It is time now to forget about the President's 185,000 bogey for 1942–43. It was so high that people who knew the facts never supported it whole-heartedly.

The American airplane industry has done a good job when you measure it by world standards. Nobody else has anywhere near equalled it. The Germans, ending ten years of wide-open effort, are failing miserably by comparison, as Churchill said the other day; they are not replacing losses, and their quality is going downhill.

And, while we are producing 150,000 airplanes in 1942–43, we are increasing tonnage immensely, mostly in emphasis on heavy bombers. Our numerical production has increased 100 percent since Pearl Harbor, but tonnage has increased 300 percent. This figure is given by the Aeronautical Chamber of Commerce.

Along with bigger tonnage, we are improving both quality and performance, with heavier armor, more and bigger guns, heavier and better radio, longer range—all of which is supported by more power. One need not draw upon optimism; present airplane progress is highly satisfactory. We are on a plateau, numerically, but the curve will angle upward again in six or eight weeks.

More Efficient, Less Colorful—The International Harvester Co. has developed its mechanical cotton picker to a point where it may well play a part in relieving the manpower shortage. After picking, the tube delivers cotton bolls into the wire netting basket atop the tractor. When filled, it is easily dumped into truck or wagon. Operation is restricted to districts where neighboring cotton gins have been equipped with cleaning and drying machinery selected for the processing of machine-picked cotton

Wage Freeze Will Take Much Administrative Activity

WASHINGTON—Wages and salaries, broadly speaking, were frozen last month by the President at the levels of Sept. 15. But that's speaking pretty broadly. There are many exceptions to the pay freeze, and an elaborate administrative machine has to be set up to determine when they apply. Economic stabilizer Byrnes, who administers the freeze generally, has assigned to the War Labor Board the job of passing on increases in wages and in most salaries under $5,000. Exceptions are salaries of bona fide executive, administrative, and professional employees who are not represented by a labor union. Pay boosts in these cases and in all salaries over $5,000 are ruled upon by the Treasury's Bureau of Internal Revenue.

Regulations Being Set Up

Early in December, the Treasury had not yet issued its regulations governing salaries, but the situation as to wages was becoming fairly clear. Employers desiring to grant general wage increases shauld submit an application to the nearest local office of the Wage-Hour Administration, which will transmit them to a regional office of WLB. Where raises were granted between Oct. 3 and Nov. 7, an application for retroactive approval may be made.

In the big, generally organized industries, the regional office will grant immediate approval to wage increases conforming to the Little Steel formula—i.e., an average increase of 15 percent above the levels of Jan. 1, 1941 will be permitted. A list of 29 industries to which the Little Steel formula applies has been formally issued by WLB.

In other industries, the board will interpret very strictly the President's order that wages be increased only "to correct maladjustments or inequalities, to eliminate substandards of living, to correct gross inequities, or to aid in the effective prosecution of the war." WLB, for instance, has no intention of permitting increases aimed at wiping out long-standing wage differentials, no matter how arbitrary the differential may be. One big exception is the differential between men and women. Any employer may raise the pay of women workers to equal that of men doing the same work, merely notifying WLB afterwards.

INSIDE DETROIT

BY RUPERT LE GRAND

Contract re-shuffling to emphasize plane production has caused scramble for new tools or contracts to fit old tools. Production of planes, ordnance and military vehicles will increase. Kanzler explained CMP to plan representatives

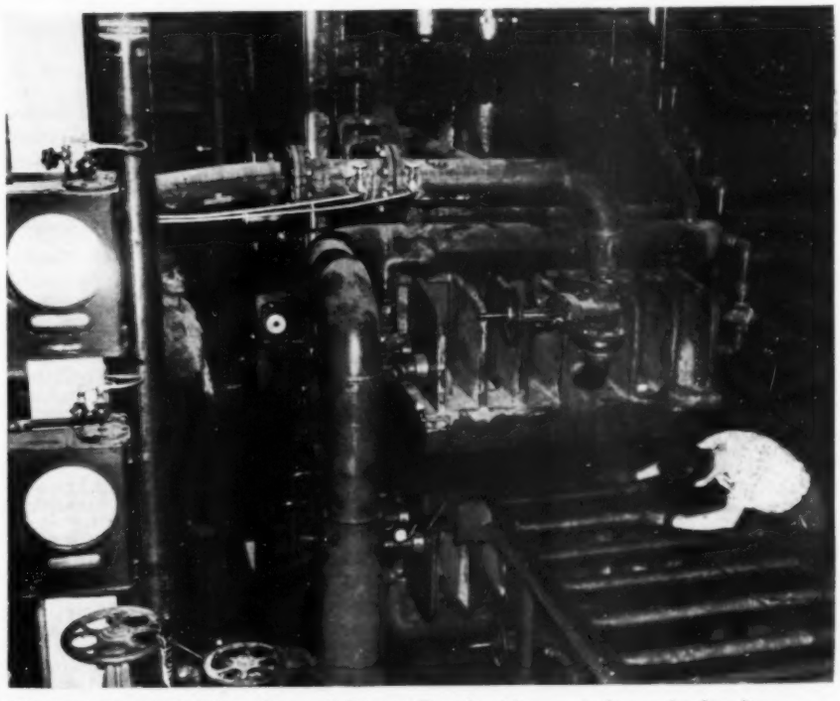
Air Production Will Increase Reports that production of ordnance and military vehicles will be "cut back" to save materials for the projected expansion of aircraft manufacture are not true. It can be stated upon the best authority that production of such materiel in this area during 1943 will be equal to or greater than current levels. The cut back will actually fall only upon future schedules that have been found out of line with the actual technical requirements of the services or too ambitious for the supply of available materials.

The "loss" occasioned by cancellation or temporary shelving of certain phases of the ordnance program will be made up by the letting of new aircraft contracts in this district. As a consequence, there will be no unemployment in the true sense of the word. In speaking of the effect of the policy upon General Motors' operations in Michigan plants, C. E. Wilson said that approximately 1000 men would be laid off, but that they could be reabsorbed immediately by other plants in the affected communities. Manpower losses to the services are of greater importance than temporary adjustments in the labor force. On the whole, employment analysts believe that employment will continue to rise, but at a decelerated pace for the next few months, until some plants are retooled for aircraft work. The machinery situation forbids an intelligent appraisal of how soon these retooled facilities can be put into production.

Some Producers Are Re-Tooling Obviously the shift in procurement policy has had repercussions throughout Detroit industry. For one thing, the enormous tank schedule for January has been pared sharply. Large increases in productive capacity, scheduled for March and thereafter, have been cancelled. As a consequence, Chrysler and Cadillac are the outstanding examples of war contractors who have cancelled commitments for machinery, materials and parts for future delivery. Several gun projects have been stopped, although there is reason to believe that they have been shelved temporarily. As a consequence, a sector of local business might be said to be going through a minor version of the conversion problem when automobile production ceased early this year.

Prime Producers Enlargen Orders The need for conversion is certainly not universal. Chevrolet, for example, is hard-pressed to find enough floor space for war contracts that in the main are unchanged to date. For this reason, it is unlikely that this manufacturer will engage in production of airframes. Spreading of existing truck orders over 1943 means that parts-producing facilities released thereby will be quickly retooled for other work, notably aircraft engines. No directive to increase engine production had been received, as of last week. On the other hand, schedules for shell, guns, and tank destroyers had not been cut. Chevrolet's record of product improvement and cost cutting on such items is believed responsible for the situation. Since a "competitor" in the cannon field lost a contract, it is possible that the services are following a policy of not disturbing prime sources.

Important phases of the new aircraft program are related to increases in existing schedules. Ford, for example, has been asked to figure on a least a half dozen engine proposals. In one case, the motor has only a relatively few parts differing from the current models in full production, but output of the additional model would be expected at a rate twice that planned for another motor plant not yet in full production. Recently, the Nash-Kelvinator contract to produce Vought-Sikorsky cargo flying boats was cancelled as a matter of military expediency. It is now reported unofficially that the business lost in this direction has been replaced by an even larger contract for cargo planes, of a type now in production and deemed more essential for reasons of standardization. Obviously, the experience that Nash

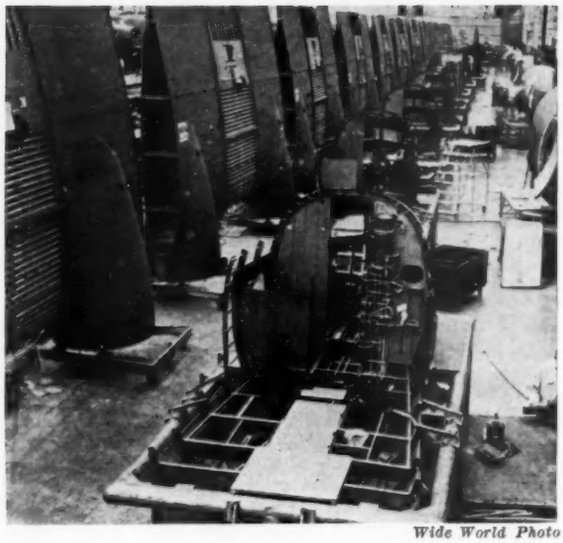


Water Cooled Dies Speed Steel Production—A huge hydraulic press, with two broad dies, capped by water-cooled platens, straighten and cool armor plate after it has rolled out of heat-treat furnaces in the Ford armor plate plant. Red hot, the strip of metal slips over rollers and then is gripped in 2,500 tons of pressure by the press. In three to eight minutes, depending on weight, thickness, width and length of plate, the metal is released

had obtained with the flying-boat tooling will not be allowed to lie fallow.

Tool Industry Is Affected Machine tool vendors and tool plants have experienced hectic days reminiscent of efforts prior to the April 1 deadline upon commitments for equipment needed in 1942. Manufacturers of ordnance affected by the decision to level off production in 1943 immediately cancelled a huge volume of equipment. Chrysler and Cadillac were in the van in this respect, but many small companies joined suit. On the other hand, new orders for machinery applicable to aircraft work poured in, so that the loss in dollar volume to date is probably not great.

To a surprising degree, armament producers have been able to "save" equipment on order, by scrambling for an aircraft job and getting a high priority. The new emphasis upon aircraft production, however, throws a heavier load upon makers of the smaller toolroom type or universal machines, and especially upon makers of precision equipment—thread grinders, universal grinders, internal grinders, internal boring machines, small gear shapers.



To Fly Away Complete — Giant bombers on a production line at a Douglas Aircraft Co. plant, move toward completion. Built in sections, the powerful fighting machines move off the line fully completed

Wide World Photo

It is no secret that many production lines are being held up now for want of one of these hard-to-get machines or for some piece of special-purpose equipment that is absolutely essential. The bottleneck in plane production continues to lie in instruments, it is said, because the smaller precision machine tools required are difficult to obtain. Machine-tool vendors report that there are so many orders already on the books for aircraft-plant machinery that new contracts may be set back unless an urgency rating is secured.

E. C. Kanzler, WPB's director of industry operations, told the writer that steps will be taken to increase the production of machine tools in those categories which threaten to hold up the enlarged aircraft program.

Emphasis Shift Eases Tooling The shift in emphasis upon war material will probably further ease the tooling situation in Detroit. For the past few weeks, the tooling load—jigs, fixtures—has declined. Fixtures for aircraft work, especially for machine tools, are not as involved as those required to produce tanks and guns. Furthermore, in most cases, the designs have been made, the production of tooling thereupon becomes a matter of duplication.

It is probable that the cutter situation will also improve. Tool breakage has been especially severe in tank plants and gun works because of the nature of the metals machined.

Representatives Heard Kanzler Approximately 3,000 representatives of Detroit's war plants assembled last week to hear E. C. Kanzler explain why it is imperative to understand the Controlled Materials Plan 100 percent and to do their utmost to make it work. Kanzler explained that the CMP is not an idea thought up by an office holder in Washington.

WAR RULINGS IN BRIEF

Checklist of Significant Regulations on Materials and Prices

AIRCRAFT & ENGINES — Manufacturers need not file with OPA prices for repair parts or specially designed airplane servicing and repair tools for which maximum prices have been established. (Amendment 56, Maximum Price Regulation 136 as Amended.)

BRASS SCRAP — Buyers of specially prepared scrap other than brass mills, ingot makers and copper refineries will follow a simplified procedure for determining prices they may pay for such material. OPA may establish prices by a letter written to the buyer rather than by previous method. (Revised Price Schedule 12.)

CHEMICALS — Adjustable pricing for sales of formaldehydes, lithopone, titanium pigments and acetic acid which are used industrially has been established to aid sellers and buyers preferring to make long-term contracts. (Amendment 3, Revised Price Schedule 98).

CHROME STEEL—Delivery and use of corrosion or heat-resistant chrome steel can be made only on preference rating of AA-5 or higher. (Supplementary Order M-21-d.)

COPPER & STEEL—Owners of idle stocks and their alloys, who sell directly to authorized war producers, are now required to report such sales. (Amendment 1, Priorities Regulation 13.)

ENAMELED WARE — Restrictions on production of various types and sizes of such ware do not apply to military orders. (Interpretation 1, Order L-30-b.)

FARM MACHINERY—Requirement of obtaining export license or Lend-Lease authorization prior to manufacture for export has been eliminated and substitute has been made requiring approval by WPB of production schedules for export. (Revision Limitation Order L-170.)

FERRO-MANGANESE — Sellers of this material made from dutiable ore to a government agency for export may charge full $135 a gross ton maximum price only if they assign duty drawback privilege to the agency.

FLUORSPAR ORES — These have been freed from price control in order to facilitate government's program for expansion of production of the metal important in manufacture of steel and aluminum. (Amendment 42, Supplementary Regulation 1, GMPR 2.)

GILDED METAL CLAD STEEL SCRAP — By-product of munitions manufacture, has been exempted from price control. (Amendment 43, Supplementary Regulation 1, GMPR 2.)

PLASTIC SCREENING — Manufacturers may calculate their maximum prices by using predetermining methods, labor rates and material prices in effect last March 31.

PRIORITIES SYSTEM REGULATIONS—Several important changes have been made which include ratings, delivery and supplies. (Amendment 2, Priorities Regulation 11.)

TIN OXIDE—Manufacture and use have been completely forbidden. (Amendment to Conservation Order M-43-A.)

TUNGSTEN—Wire, rod, sheet and powder have been placed under complete allocation control. (Amendment to Preference Order M-29.)

WARTIME WASHINGTON

BY BLAINE STUBBLEFIELD

Maritime Commission's cancellation of Higgins contract found justified, but uncalled-for delay caused million-and-a-half dollar loss. Nelson and aides blamed for insufficient steel. Steel purchasers violated regulations. Tool experts to aid

House Group Condemns Delay In its report on cancellation of the Higgins New Orleans ship and facilities contract, the House Merchant Marine Committee soundly rebukes the Maritime Commission for dallying 13 days from July 10, when it decided to cancel, to the effective date of cancellation, July 23, while nearly one and a half million dollars in addition to previous commitments, was wasted. As of October 1, outstanding commitments in the Higgins yard totaled $11,159,308.

Last May it became apparent to the Commission, as a result of a careful survey, that its existing 171 ways, including 28 in the proposed Higgins plant, all producing at the rate of 4.68 ships per way per year, could turn out 29,000,000 tons of shipping in 1942-43, instead of the 24,000,000 tons called for in the President's directive. Technicians now estimate the production rate in 1943 at 9.92 ships per way per year.

Steel Shortage Was the Cause It was lack of steel, and that alone, which caused the Higgins cancellation, and which prevented the United States from having an additional 5,000,000 tons of shipping (the difference between 24 and 29 millions) to outrun the enemy's submarine campaign. Five million tons would have exceeded the 4,000,000 tons estimated lost by the United States and allies in the western Atlantic since the war began. This estimate is based on an unofficial tally by the United Press, which counts 572 ships sunk, averaging 7,000 tons apiece.

Failure to produce and properly allocate sufficient steel is blamed upon "subordinates" of the War Production Board, who passed the buck and failed to assume full responsibility, the Committee says. The language then points the finger at Nelson when it says, "Since the early hearings the Chairman . . . has been streamlining his organization." . . . There was lack of coordination of the activities of the Iron and Steel Branch and . . . confusion as to methods of allocation . . ."

Report Makes Suggestions Four recommendations are offered: (1) that a careful audit be taken before final settlement of the Higgins and other ship contracts; (2) that the Higgins property be used at the earliest date; (3) that every effort be made to speed production and allocation of materials (the Committee recognizes new methods of allocation worked out while its report was in the making); and (4) that the Commission restudy its present form of contract with a view to preventing exorbitant profits.

The Higgins contract, for example, provided a base fee of $110,000 for each vessel completed, with numerous bonuses and some penalties. Higgins would have received a fee totaling between $12,000,000 and $28,000,000 had his contract been completed. If the contractors' fees were not cut, they would receive extraordinary profits because the capacities of shipbuilding facilities are now at least three times what they were last January. On this account, fees are being cut, as much as 50 percent.

Rules Have Been Violated Hearings revealed that steel allocation regulations have been violated in various ways. One of these is the "split order" in which several less-than-carlot orders are placed to obtain one large order, which could not otherwise be delivered without WPB approval. The practice results in prices higher than ceiling, too. Warehouses received more than their WPB quotas, and they received shipments in preference to consumers. Higgins said that he was able to obtain steel at less-than-carlot price from warehouses but was unable to place a mill order and obtain a reasonable delivery date.

The Committee ascertained that salesmen who had no warehouse or yard were dealing in steel and selling it at prices in excess of ceiling.

Needless to say, all information obtained by the Committee is in the hands of WPB and OPA; investigations on all counts are under way, and some corrections have been effected. The Committee seems to feel that WPB's new steel allocation program partly results from its work.

Navy Cancelled Orders Sooner Navy Bureau of Ships made known at hearings that it has had to cancel additional facilities contracts at at least four yards, totaling about $30,000,000. Apparently Navy was wise to the steel situation ahead of the Maritime Commission; its cancellations were made back in April, four months before the Commission took action.

The Committee abjures any blame that may have been reflected upon Higgins, quoting Commission members in the unanimous opinion that he could have built the ships efficiently and swiftly.

Loan Machine Tool Experts The War Production Board has assigned 16 industrial specialists on machine tools to its field offices. These specialists, who will be sent to areas where their services will be of the most value, will get their directions on the machine tools program from the Tools Division. The specialists are expected to aid manufacturers on anything pertaining to the production of machine tools, production tools, chucks, anti-friction bearings and the like.

Metals Yardstick Is Adopted Steel, copper, and aluminum have been adopted, in the Controlled Materials Plan, as the yardsticks for war production. The same yardsticks can be used as a rough measure of the extent to which civilian industry—including civilian-type "indirect military" activities like freight car building and synthetic rubber plant construction—has been cut into by the competition of specifically military munitions. Government estimates indicate that, by these yardsticks, the civilian economy has had rather more than half its bulk sliced away. Civilian use of steel has been cut about 58 percent, from around 67,000,000 tons in 1940, to 27,800,000 this year. Cut in copper is nearly 50 percent, from 896,000 tons to 458,000. Aluminum is cut 80 percent, from 304,000 tons to 60,000.

Move Nearer Supply Source The ammunition supply division of Ordnance Field Service is moving from Washington to Philadelphia in accordance with Maj. Gen. Levin Campbell's decentralization policy. The objective is to place administrative offices in proximity to operations. This move puts ammunition hard by the Frankfort and Picatinny Arsenals. Such proximity will probably pay dividends in facility and economy of communication, and serve to speed products.

New Liberty Ship Has Been Designed to Out-Speed Subs, Carry More in War and Peace

Germany's failure to sink American intervention shows up plainly (1) in our success in meeting the President's ship tonnage program, and (2) in the Maritime Commission's announcement of a new Liberty ship design. Obviously, the schedule of 24,000,000 tons of shipping this year and next year was drawn up to beat the Axis, with a margin of safety. And as for the new design, it incorporates new features for peacetime competition. When the sub menace was grim we talked about anything that would float; now, we take time out to develop a ship that will be better for war and peace.

Some Commission engineers, tired of press heroics on quick launchings, are trying to play them down. To be frank, these records are being set up for the grandstand. But they are all to the good. They steam up the competitive spirit among shipyard managements and workers; they delight the public and give the enemy the dithers.

The Kaiser System

This is how the improbable Mr. H. J. Kaiser and his rivals do the trick. First they build a complete set of huge subassemblies in the prefabrication bays. Then they throw down a keel on ways still sizzling from the last launching, and start hoisting hunks of ship as big as a ten-room house.

An 8,000 ton ship recently was prefabricated to such extent by the Pacific Bridge Company that only 40 lifts had to be made by the cranes to assemble the various sections, so that the ship went down the ways 70 per cent complete. Kaiser's latest record, on the 10,000-ton Liberties, is 111 hours.

Prefabrication not only spreads the parts of the ship out so a lot more yard men can have room to work on them, but it permits some 2,000,000 people, connected with 800 industrial plants throughout the country, to contribute to the merchant marine, by making sub-sub-assemblies, which are put together in the prefabrication bays around the ways. The final assembly you read about in the papers is more or less like setting the dinner table in a few minutes, after you've been cooking all afternoon.

More Than Meets the Eye

There is much more to the shipbuilding speed formula than prefabrication. It consists of simultaneous production of design, development, working drawings, special materials, materials requisitions, and the placing of contracts. All these jobs are now done at the same time, rather than one after the other.

The Commission now has about 60 yards, and more than 300 ways. Some of these facilities have been turned over to Army and Navy for building their own special types because: (1) the special boats were urgently needed; (2) because the Commission's quota of steel ran short; and (3) because rapid building was able to keep up to the President's schedule using less and less ways. The main advantage of quick assembly of prefabricated parts is the increased number of ships that can be built per way. That, after all, is the true measure of shipbuilding speed. Mr. Kaiser has said that a ship per way per week can now be visualized as a future possibility.

Cut Time to a Third

The shipbuilders have cut their time more than three-fold in eight months. Last March the average on EC-2s (Liberties) was 149 days from keel-laying to launching plus 78.8 days outfitting for delivery, a total of 227.8 days. In October, these figures had been reduced to 48.5 days and 15.9 days respectively, a total of 64.4 days from keel to delivery.

The President's program is 8,000,000 tons of shipping this year, 16,000,000 in 1943. Since the inception of the Commission's program in 1937, up to October this pear, 2800 ships, EC-2 and C types, and tankers and others, have been ordered. This does not include 800 small craft for United Nations account. During one year ending October 1, 1942, contracts were placed for 1851 vessels, of which 712 are C ships and 1139 are EC-2.

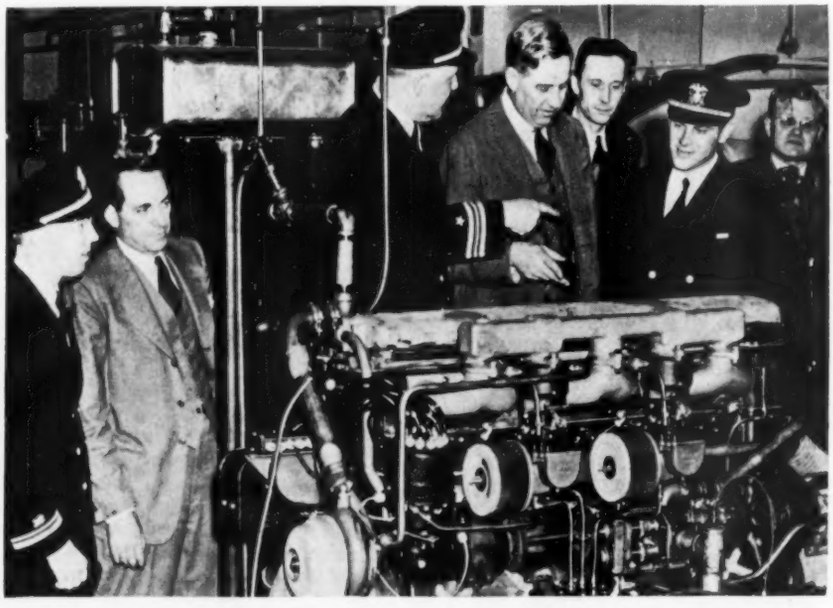
Land Expects Fulfillment

On November 1 we had delivered six million of the eight million tons scheduled for this year. In October we delivered 890,000 tons. We must deliver a million tons in November and a million in December to make the goal. Admiral Emory S. Land, chairman of the Commission, thinks it will be done.

Scheduled delivery of our planned merchantman program is convincing argument that enemy submarines are beaten in their attempt to sink American war supplies. Another indicator, and a contribution to that end, is the Maritime Commission's new Liberty ship design.

For the Peace to Follow

The new ship will have greater length, slightly more beam, and greater carrying capacity. Greater power and an improved hull form will give it increased speed. The additional speed will make it less vulnerable to submarine attack in wartime, and "greatly improve its competitive value commercially in the post-war era." This concern about peacetime service of the ships seems to reveal less concern in the Commission about its ability to beat the submarines.



Navy Inspects First Hudson Invader—Naval officers expressed themselves as pleased with the performance of the powerful marine engine which will drive our invasion barges. Conversion to manufacture of this big engine is considered a remarkably speedy job, inasmuch as all of the tools had to be made especially for this contract, and about 700 machines had to be converted. Shown above with the engine are, l. to r., Lt. V. M. West, N. K. Van Derzee, manager, Hudson war contract division, Lt. Comm. R. N. Brown, H. M. Northrup, Hudson vice president, L. K. Rosenberg, master mechanic, Lt. G. D. Peterson and E. A. Taylor, works manager

Standard System of Color Determination is Adopted

NEW YORK—A new war standard for color specifications, expected to eliminate much existing confusion in matching colors, was announced recently at a luncheon meeting under the auspices of the American Standard Association. Several hundred executives of industries in which color is an important factor attended the meeting. R. E. Zimmerman, vice president of the U. S. Steel Corp. and head of the Association, presided.

Request for the standard was made jointly by the General Electric Co. and the Interchemical Corp. The objective of the standard, which sets the specification and description of color, is to reduce to a common language the results of years of technical developments in the measurement of color so that it may be specified in terms comprehensive to all users.

Spectrophotometer is Basis

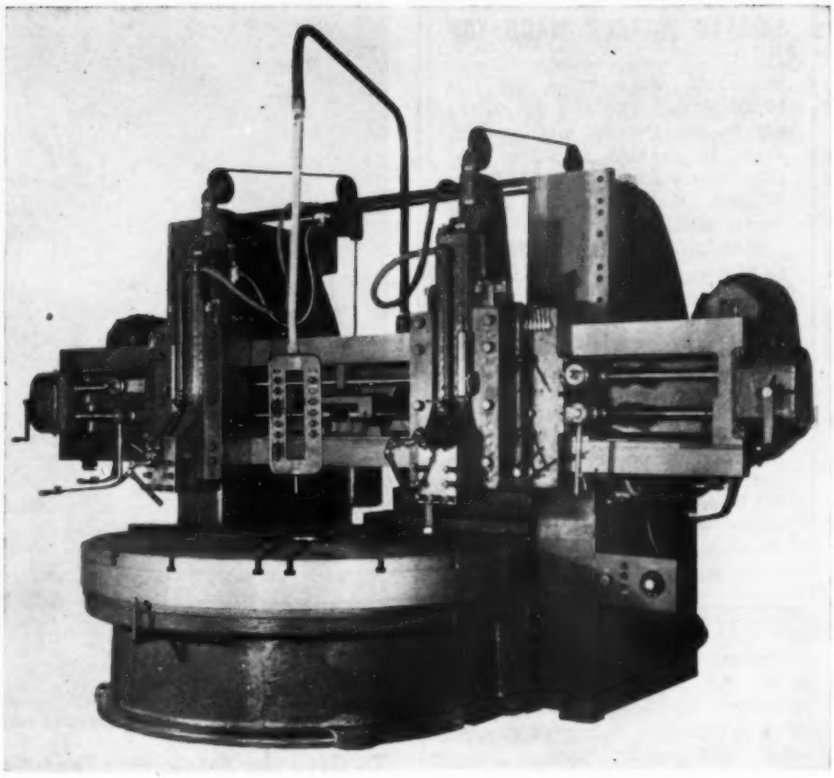
As the basis for the new color language, the standard recognizes the spectrophotometer as the basic instrument for the standardization of color, and the use of color samples which have already been calibrated in terms of the fundamental standard, as the samples in the 1929 Munsell color book. Either of these two standards makes it possible, for example, to identify a color or to compare two colors by telegraph by sending numbers.

In the practical application of this system, colors, in their varying hues and shades, may be recorded for posterity in terms of exact scientific data. A color may be analized in two or three minutes, the results telegraphed across the nation and an exact match produced on the basis of this information.

NASH BUILDS MOTORS

KENOSHA—Production of Pratt & Whitney 2300-hp. aircraft engines is underway here in converted Nash facilities two months ahead of schedule, and seven months after signing the contract. The engine, equipped with a two-stage supercharger of practically equal size, will lift Vought "Corsair" Navy fighters in the air faster and higher than any other plane in the world.

Nash so converted a group of factory buildings that the main aisle is in clear view for ½ mile. Engine assembly and tear down operations are considered the most modern in current practice, are carried out in parallel lines ¼ mile long. When in full production, the plant will employ three times as many workers as during peak automobile production.



Started From Scratch—Having opened its Mineral Ridge Plant in May, 1942 with three employees, Federal Machine and Welder Co. now has a force of over 100 and is assembling boring machines used in turning out turrets and turret rings for tanks. Over ninety sub-contractors prepare the sub-assemblies. Production planning has been under the personal direction of M. S. Clark, president, and C. H. Whittier, factory manager. Each machine covers a floor space of 196 feet, is nearly 15 feet high and weighs 110,000 pounds. There are approximately 750 parts in each machine. There are two different models, one with a capacity of 100 inches and the other with a capacity of 112 inches

As an instance of practical application, in the aircraft plywood program a prime contractor may have as many as fifty sub-contractors building wing and tail parts, complete wings, fuselages, etc. Most of these call for camoflage green, a difficult color to match so that it will be the same under all light. Color chips used by sub-contractors to arrive at this color may vary widely because of deterioration or because the chips were furnished from the standards of different manufacturers. Thus, when the different parts are assembled, there may be wide variance in color, causing a loss of production time if government specifications are to be met.

In filling an order in which the spectrophotometric specification is given, the trained colorist will know at once by the monochromatic data the nature of the color required. The finished material will then be checked on the spectrophotometer to match exactly within the given tolerances of the specification.

Speakers on the program were Dr. A. C. Hardy, Professor of Optics, M.I.T., Dr. D. B. Judd, National Bureau of Standards, Dr. Lloyd Jones, Eastman Kodak Co., Lt. Col. F. F. Steadman, Quartermaster Depot, Philadelphia, A. W. Chauncey, v. pres., Interchemical Co. and E. S. Lee, director, General Engineering Laboratories, General Electric Co.

Maintenance and Repairs Again Rank AA-1 Priority

WASHINGTON—If you read newspaper accounts of the decision by WPB's Requirements Committee to permit use of the top AA-1 priority ratings for maintenance and repair needs, you may have assumed that there is some way you can dash out and start applying the rating. You can't. Actually, nothing has happened yet. The policy statement is just that—a policy statement—and nothing more. Only gradually will it show its effects in formal priority orders. The thing is that WPB has now returned to the view—temporarily abandoned last June—that keeping existing essential equipment in good operating condition is a matter of first importance.

SKILLED WORKER WAGE TOP

DETROIT — Establishment of maximum wage rates for the 50,000 skilled tool and die workers in the Detroit metropolitan area, to prevent pirating, was recommended to the WLB by William E. Simkin, its special representative.

Simkin also recommended assignment of a special WLB representative to the area who would have power to interpret the Board's decisions in the tool and die industry.

WLB already has taken steps toward eliminating pirating of skilled workers in the area, but Simkin's proposals would make the safeguard airtight. Under a WLB order of October 16, provision was made that no employer could pay more than maximum rates for the industry.

To Give the Axis a Hot Foot—White-hot electrodes of a new electric furnace about to be lowered into position. A part of the Defense Plant Corporation's expansion of Carnegie-Illinois Steel Corporation's Monogahela Valley facilities, this new U. S. Steel unit will produce urgently needed alloy steels to strike more forceful blows at the Axis

Previous to the creation last June of the AA ratings, nearly all major industries had access to an A-1-a priority, then the highest, for maintenance and repair needs. But the double-A ratings were second-front ratings, designed, originally at least, to produce armament quick for the African offensive. Hence many of the repair ratings were not stepped up to the AA level. But repairs can't be deferred indefinitely, and the Requirements Committee has now decided to go back on to a permanent basis.

The new policy doesn't mean that all repairs are sacred; it will be rigidly selective. Early beneficiaries will be the utilities and extractive industries. Manufacturing firms operating under PRP now have an AA-2X or AA-1 rating on their own repair needs. But in the first quarter of next year, manufacturers of parts for essential domestic and industrial equipment will get high ratings.

Stainless Steel Recovery Program Is in Operation

WASHINGTON—WPB's Steel Recovery Corporation at Pittsburgh has got under way with recovery of stainless steel, and expects to pull in, or redistribute, around 60,000,000 pounds, all told. The steel recovery program includes 16 categories of steel.

There are some 200,000 users of steel. In order to find out just what kind of questionnaire to submit to all those people, the corporation sent out first a preliminary inquiry on October 22. It already has received about 100,000 answers.

On November 2, inventory report forms and price schedules went out to all known holders of idle and excess stocks of stainless steel products.

The following points apply to stainless steel recovery and to the entire 16-category recovery program: (1) The Government will try to find users of the recovered steel in its "as is" form; (2) Holders are urged, however, to sell their stocks directly if possible; (3) When direct transactions cannot be made, the Corporation will offer rolling market prices for holdings; (4) Holdings that cannot be used in the war effort in "as is" form will be purchased by the Corporation and sold as scrap.

The Corporation has established a scrap price which is above the scrap market rates, applicable to all holders.

It's a "voluntary" program, brother, but if you don't ante, in the words of Col. C. R. Baxter, chief of the materials redistribution branch of WPB, ". . . we have not hesitated to use our wartime requisitioning power wherever holders refuse to sell."

Excess Copper Inventories to be Seized if Withheld

WASHINGTON—Holders of idle and excessive inventories of copper and copper base alloy products, who have been negligent in filing reports, or who refuse voluntarily to sell their materials for war use, will be the object of government action, it has been announced by Col. C. R. Baxter, U. S. A. Chief of the Materials Redistribution Branch of the War Production Board.

Holders of 64,000,000 pounds of copper thus far refused to sell their idle and excessive materials, however, and the government will institute requisitioning action whenever necessary, he said.

War producers are urged to use the facilities of the Copper Recovery Corporation, 200 Madison Ave., New York, N. Y., in filling emergency shortages of copper in various forms.

Sharp Increase in Women Engineers is Predicted

CHICAGO—A "census" of women enrolled in engineering schools will this year be included in the annual survey of engineering enrollments made by the Society for the Promotion of Engineering Education.

The part women are playing in the war effort, especially as technicians and even a few as engineers, cannot be overlooked, said President Henry T. Heald of Illinois Institute of Technology, current president of the Society, in making the announcement of the census. Engineering will depend more and more upon women in the coming years.

LINES ON AIRCRAFT

High strategists' caution concerning a mid-war large-scale shift from surface shipping to air freight is said to have caused cancellation of Nash-Kelvinator's cargo plane order

Cancellation of Nash-Kelvinator's contract for a huge fleet of Vought-Sikorsky S-44 "Excalibur" cargo planes for Navy seems to signalize a Navy aviation policy commitment. You will recall that, a few weeks back, public clamor for a great air cargo fleet to carry war supplies and men all over the world, forced Donald Nelson to appoint a special committee to report on war air transport. The report was not published but we know roughly what it said: high strategists of United Nations want to stick to surface shipping rather than risk a major shift to relatively-untried air freight in mid-war.

Shortly after that the Army refused to go whole hog for air transport. The Army said it had already increased its cargo plane production to over 30 percent of its multi-engined production, and that was all the capacity it could afford to take away from combat production. In line with this policy, the Army refused to allow Kaiser and Higgins to use strategic materials in their proposed cargo planes. In canceling the Nash-Kelvinator contract, the Navy is taking substantially the same position that the Army took—namely, it feels it must give its fighting men fighting airplanes first.

Wooden planes for Navy, to replace the discontinued all-metal cargo program, had not been indicated at this writing, although rumors had been tossed around. It should be noted, in this connection, that the Army has not gone off the deep end on wooden planes as yet, either. Most informed persons still believe that the deal with Higgins to build 1,200 wood cargo ships was stuffed down the Army's throat by the President. If the contract is signed, Army could still find reasons for canceling it later on. Wood construction is successful, but it takes engineers and manpower, same as metal.

The fortunes of war can produce unexpected events. The German air force, as Churchill says, is not fully replacing its losses and its quality is declining. It might be that the Army would soon have enough combat aviation to swamp the enemy, and go for cargo equipment in a big way. The urge to switch from surface ships to air cargo grows less every week as the Allies' delivery of ships outruns the enemy's submarine war. The shipping situation will be still farther eased when the Mediterranean shortcut to the East is safe.

A large fleet of the big four-engined S-44s had been ordered from Nash-Kelvinator—more than 500 and less than 1000, at a cost of much over $100,000 apiece. First deliveries would have been early next year. This was N-K's third largest contract, according to persons who have talked with company officials; contracts for Hamilton Standard propellers and Pratt & Whitney engines both were larger. It is said that these two contracts are being increased as partial compensation for loss of the Vought-Sikorsky business.

Not an official word is said but a reliable report has it that Consolidated Aircraft is getting possession of the nearly-completed N-K plant. Consolidated builds a series of five PBY two-engined patrol bombers, including the Catalina which followed the battleship Bismark; the four-engined PB2Y Coronado for the Navy, and the famous four-engined B-24s, team-mates for the Army's Boeing B-17s. The B-24 has been used only by Army and the British, but now the Navy says it will get B-24s too. This seems to confirm Consolidated's accession to the N-K plant.

Much will be lost, of course, in converting the N-K plant to another type of plane, whatever type it may be. Many of the jigs, fixtures, tools, in the Louisiana plant will be lost, likewise many in the Company's northern works, which would have produced parts for shipment and assembly in the south. Of course most of the machines can be used where they are, some with re-tooling, or sent elsewhere.

RECOGNIZE MORALE SUPPORT

CLEVELAND—With the thought that the man behind the man behind the gun also travels on his stomach, Cleveland Automatic Machine Co. is awarding victory workers', pins to the wives, mothers or sisters of employees of their E-rated plant.

In announcing the plan, President A. L. Patrick stated in a letter to each employee, "The women at home are just as much a part of this work as they would be running a machine. Their job is to see that the health and morale of their men is maintained."

Quick On the Take-Off—The "Sentinel," built by the Stinson Division of Vultee Aircraft, Inc., climbs almost vertically after a short take-off run. In working directly with the ground forces, this small, rugged, highly maneuverable ship can operate from cow pastures, highways or other improvised landing fields. Designed to be the "eyes upstairs" of the Army ground forces, the "Sentinel" can hover at speeds below 45 miles per hour while directing artillery fire or the movement of tanks or troops below

Brazil Can Help Allied War Effort in Variety of Ways

NEW YORK—Brazil has a variety of materials and services to offer the war effort, but each is in need of considerable developing before the potential values thereof may be realized. Such was the analysis made by John F. Chapman, foreign editor of Business week, upon his recent return from South America.

Brazil has the biggest industrial potential of any nation in Latin America, with one of the world's greatest reserves of iron ore and manganese, enough coal to meet many of the country's most urgent needs, and excellent deposits of bauxite not far from the great electric power plants of Sao Paulo, Mr. Chapman pointed out. A pilot plant for the extraction of lead ore is already in operation.

Industrial development is such that military trucks, or even tanks, could be assembled in the plants of General Motors and Ford, though the bulk of parts would come from the United States. At Sao Paulo is a nucleus of skilled workers capable of producing good quality metal products. However, to convert Sao Paulo's thriving but individualistic machine plants to munition production will require rationalization on a broad scale if they are to get into production that will be important to the war effort.

Mr. Chapman compared Brazil to the United States in the autumn of 1940 and the early months of 1941, in that there is still no systematic rationing of the limited supplies of raw materials and no carefully worked out plan to turn the country's tremendous energies and facilities into the most effective production program. Further, lack of adequate transportation is creating acute shortages in various parts of the nation.

He pointed out that, to the American business executive, the most significant wartime development in the Rio de Janeiro area is the appointment of a technical mission from the United States. Object is to survey the country's industrial equipment, labor output, electric power potential, raw material supplies, and transportation system, and to recommend how it can be most effectively utilized in the war effort.

"The war is giving Brazil at least a 20-year boost on the road to greater economic prosperity," said Mr. Chapman. In the north vast tropical jungle areas are being developed to produce materials no longer available from the Orient. In the south industrial expansion is readily possible under Brazilians capable of managing large new enterprises or of handling their own plants efficiently under the remodeling and rationalizing that is bound to take place. "Brazil stands a fair chance of coming out of this war with more benefits than almost any other Latin American country," concludes Mr. Chapman. "This is due to the fact that it has the economic potentialities and a President who is shrewdly getting everything for his country that he can.

Decals Spur Production — Gorton machines completed ahead of schedule are "hi-signed" with red, white and blue victory decalcomania. George Gorton, Jr., v. pres., and George Gorton, Sr., pres. and founder of the Gorton Machine Co., watch Bill Lipp, assembly dept. gen. foreman apply a victory slogan

Tool Salvage Film Offered

CHICAGO—"Save Those Tools" is the subject of a one-reel sound motion picture recently released by International Harvester Co. The picture shows how the Harvester Company's tool salvage program was organized and its methods, from salvage at individual plants to the central clearing house for the utilization of excess and obsolete tools.

Emphasis is given to the low-temperature brazing process of repairing broken or damaged tools of various kinds. Slitting saws, reamers, drills, broaches, hobs, milling cutters, etc., are repaired, ground smaller, or made over to assure that valuable tool material gives maximum service.

This picture has been approved by WPB officials and many organizations interested in the acuteness of the tool problem. Prints are available in 35 or 16 mm. sizes, with no charge other than transportation. Requests for bookings may be addressed to International Harvester Co., 180 North Michigan Ave., Chicago, Ill.

"Jack Pot" Plan Discourages War Worker Absences

SEATTLE—Up to $1,600 worth of War Bonds per month are offered each month by the local plant of the Webster-Brinkley Co. as the plus-incentive to keep war workers on the job every working day. Under what they call their "Time Clock Jack Pot" plan, opportunities for War Bond prizes are based upon attendance points. Scores are based on actual attendance; under this plan there are no "good reasons" for not working.

George Gunn, Jr., president of the company, explains that the plan can be applied to the promotion of safety and to other objectives.

Washington Appointments

WPB, Industry Advisory Committees:

Presiding Officers: B. H. Firth, Metal Reflector Subcommittee of Incandescent Lighting Fixture Industry; John Herrmann, Busway Subcommittee of Knife & Enclosed Switch Industry.

WPB, Miscellaneous:

Alexander C. Brown, deputy chief of the Iron & Steel branch; Harold J. Ruttenberg, assistant to the director of Steel Div., for more effective cooperation between labor and WPB; W. A. Hauck, assistant chief of Steel Control Section, Controlled Materials Plan recently adopted; George L. Gillette, director Farm Machinery & Equipment Div.; George Krieger, deputy director of same Div.; Frank Smith, deputy director Smaller War Plants Div., will have direct control of six operating branches of which most important are: Agencies Contact Branch under O. S. McPherson, Facilities Branch under B. T. Bonnott, Plant Service Branch under Leo Rush, Field Control Branch under Charles H. McArthur.

WPB, Regional Offices:

Deputy Regional Directors: William G. Morrison, Dallas; Robert W. Gordon, Denver; Hugo A. Weissbrodt, Detroit; Roy W. Webb, Kansas City; A. G. Daggett, Minneapolis.

War Manpower Commission:

L. B. F. Raycroft, director of the region including Delaware, New Jersey and Pennsylvania.

Miss Sara Southall, consultant to Brig. Gen. F. J. McSherry, director of operations.

NAMES in the NEWS

Joins Carboloy

HARRY CRUMP

Follansbee President

LAUSON STONE

A.S.T.E. Regional Head

LESTER M. COLE

Lauson Stone has resigned as assistant to the president of Jones & Laughlin Steel Corp. to become president of Follansbee Steel Corp., succeeding W. T. Brownscombe who has resigned because of ill health.

George C. Johnson has been named president of Cleveland Hobbing Machine Co. He will retain his position as president of Enamel Products Co. with which he has been associated for 27 years. The close relationship between these companies existing for many years will be maintained through Mr. Johnson's election.

Harry Crump has joined Carboloy Co., Inc., as assistant to the sales manager. He was connected with General Electric Co. for the past 26 years, and since 1929 has been development engineer on carbide tool applications at the central works laboratory in Schenectady.

Lester M. Cole, who is district manager of the Houston office of Warner & Swasey, has been elected a director of the American Society of Tool Engineers for region No. 17, the Houston Chapter.

Karl Landgrebe has been appointed vice president of Goslin-Birmingham Mfg. Co. Recently he retired as vice president of Tennessee Coal, Iron & Railroad Co. after 43 years of service.

Forrest Nagler has been placed in charge of the engineering and development department of Allis-Chalmers Mfg. Co., succeeding Edwin H. Brown who is serving as assistant chief of Iron & Steel Branch, WPB.

John C. Cushing has been appointed assistant manager of industrial relations of Scully Steel Products Co. He joined the company in 1940 and for the past two years has been assistant to the director of industrial relations.

Charles Nelson, Jr., has been named chief engineer of Ahlberg Bearing Co., Chicago, in charge of bearing design and development work. Since 1933 he has been assistant chief engineer at Ahlberg.

Robert C. Mathewson has become assistant manager of the Chicago office of American Bosch Corp. Formerly Mr. Mathewson was assistant chief engineer of the engine division, Worthington Pump & Machinery Corp., Buffalo works.

Harold P. Wade has been appointed general manager, Adel Precision Products Corp., Burbank, Calif. Since last March he has been manager of the company's engineering service office in Detroit.

M. L. Carson has been made manager of Allis-Chalmers Mfg. Co., engine and condenser department. He has been connected with the firm since 1916 and has been in charge of the department since last February.

Herman C. Frentzel and Charles G. Eisenberg have been promoted to the positions of works manager and chief inspector, respectively, of the Heil Co.

George D. Gilbert has been appointed general manager of Baldwin-Duckworth division of Chain Belt Co. at Springfield and Worcester; and William H. Gates has been named works manager.

W. P. Hopkins has become purchasing agent of Tuthill Pump Co., Chicago. He was formerly assistant purchasing agent for the ordnance plant at Marion, Ohio, and was previously associated with the Illinois Central system.

Thomas W. Howard has been appointed manager of the department of manufacture of the Chamber of Commerce of the United States of America. Mr. Howard has been assistant manager for the past five years.

Dr. Walter R. Meyer has been named technical director of The Enthone Co. and will direct the development of new products and processes for the metal finishing industry. For several years Dr. Meyer was electrochemist and metallurgist of General Electric Co., and editor of "Metal Finishing" for the past four years.

F. T. Smye, formerly executive assistant to the director-general, Aircraft Production Branch, Department of Munitions and Supply, Ottawa, has been appointed director of the production program, Aircraft Branch.

J. O. Walz has been named assistant manager of the small motor division of Westinghouse Electric & Mfg. Co., at Lima, Ohio, and J. D. Miner has become manager of engineering. Both men have been associated with the company for many years.

G. V. Bate has been appointed superintendent of the Sunbury Wks. of Westinghouse Electric & Mfg. Co. He joined the radio division in 1929 and has served in the engineering and works departments.

George A. Lennox, assistant sales manager of Driver-Harris Co., has been promoted to the position of general sales manager. Mr. Lennox has been associated with the company since 1907 and became district sales manager of the Chicago territory in 1917. Joseph B. Shelby has been appointed assistant sales manager of Driver-Harris. He joined the company in 1918 as sales engineer and prior to his new appointment was manager of the foundry.

Hugh L. Dryden of the National Bureau of Standards has been elected president of the Institute of the Aeronautical Sciences for 1943. Dr. Dryden has been connected with the Bureau since 1918 and has supervised the research on aircraft structures and instruments.

BUSINESS ITEMS

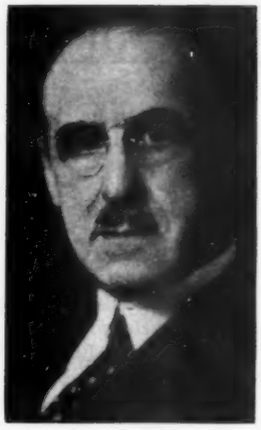
Joshua Hendy Iron Works has purchased the Crocker-Wheeler Electrical Mfg. Co., with its manufacturing plant in Ampere, N. J., and district offices in principal cities. The acquisition of this company involves plans for the expansion of both firms for combined operation as well as the manufacture

Pach Bros.

W. S. FARISH

CLAYTON O. SMITH

F. J. WESCHLER



F. M. BECKET

of electrical apparatus at the Hendy plant in Sunnyvale, Calif.

Reiner Machinery Corp. has announced its location at 521 Fifth Ave., New York, N. Y.

Attridge and Miller Machine Works, Ltd., is located in its new plant at 125 12th Ave. W., Calgery, Alta., where equipment has been installed to handle all classes of crankshaft grinding, cylinder reboring, electric and acetylene welding, tractor, automotive, babbitting and engine rebuilding work.

A. R. Gieringer Tool & Mfg. Co., is the new name for the former Esquire Tool & Die Corp. of Milwaukee.

The H. L. Harvill Co. has purchased a plant at 2223 E. 37th St., Los Angeles, for the production of die-casting dies, centrifugal, pressure and die-castings as well as permanent molds. H. L. Harvill, a pioneer in the aircraft die-castings field, is head of the company. R. C. Beck has been named chief engineer and S. I. Gleason is metallurgist.

E. J. Rowan has announced the opening of an office at 225 Broadway, New York City, as consultant on procurement, production and inspection of gages, tools and interchangeable metal parts.

Curran Corp. is opening a war products development laboratory in its Prospect Mills processing plant at Lawrence, Mass.

OBITUARIES

William S. Farish, 61, president and chief executive of the Standard Oil Company of New Jersey passed away suddenly of a heart attack at his hunting lodge in Millbrook, N. Y. Mr. Farish was intimately connected with the development of the oil industry and was a pioneer in the formation of the first important oil pool in Texas and in the development of the Humble Oil Company. He was an organizer and later president of the American Petroleum Institute. Through association with the National Petroleum War Service Committee in World War I he became associated with Standard Oil Company.

Clayton O. Smith, treasurer and general manager of O. S. Walker Co., Inc., since 1919, died of a heart attack at his home recently. Previous to his connection with that company he had been sales manager of the Norton Grinding Co. for 15 years. He received his B.S. in mechanical engineering from Worcester Polytechnic Institute in 1892 and was awarded a bachelor degree in electrical engineering the following year.

Frank J. Weschler, vice president of the Chain Belt Co., and general manager of Baldwin-Duckworth division of the company at Springfield and Worcester, passed away suddenly in Worcester. In 1927 he was president and treasurer of the Baldwin Chain & Mfg. Co., and upon the merger of that company with Duckworth Chain & Mfg. Co. in 1930 he became treasurer and general manager of the newly formed Baldwin Duckworth Chain Corp. When the corporation merged with Chain Belt Co. in 1939 Mr. Weschler became vice president.

Frederick M. Becket, 67, a consultant to Union Carbide & Carbon Corp., died in New York City recently. He was formerly president of Union Carbide and Carbon Research Laboratories, Inc., and vice president of Union Carbide Co., Electro Metallurgical Co. and Haynes Stellite Co., units of Union Carbide & Carbon Corp. For his achievements in metallurgy Dr. Becket received the Perkin Medal, the Elliott Cresson Medal of the Franklin Institute, a Modern Pioneers Award of the N.A.M. and the Acheson Medal of the Electro-Chemical Society. He originated and commercialized the fundamental principle of producing low-carbon ferro-alloys and alloying metals.

Robert H. Weatherly, since 1912 president of Pilliod Company, died at the age of 69.

Edmund H. Boswell, 61, general manager of the Dunkirk, N. Y., plant of American Locomotive Co., passed away suddenly.

Lawrence A. Sorensen, 52, manager of the Buffalo plant of American Brass Co., died after a six months' illness. He has been connected with the firm for 37 years.

Philip A. Geier, 65, who was founder and chairman of the board of P. A. Geier Co., passed away in Cleveland.

M. Lloyd Hollister, president of W. S. Rockwell Co., recently passed away.

Earl H. McCarty, 56, former president of Nash Motors Co., died following a heart attack. He was head of the firm since 1932.

Fred C. Chandler, Jr., 42, president of Chandler Products Corp. died recently in Cleveland.

Norbert A. Milhaupt, 57, superintendent of the milling machinery department of Kearney & Trecker Corp., passed away after a short illness.

James W. Fitzgerald, 65, who had been research engineer for Briggs & Stratton Corp., died suddenly.

Harry A. Post, 78, founder of the Ohio Mfg. Co., passed away in Painesville, Ohio, recently.

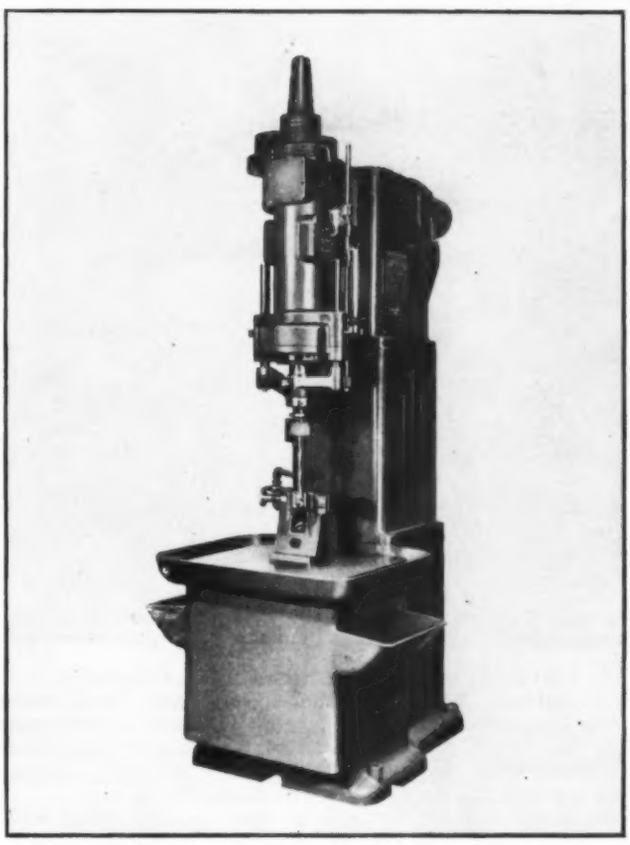
MEETINGS

Society of Automotive Engineers. Annual meeting. Book-Cadillac Hotel, Detroit, Mich. Jan. 11-15.

SHOP EQUIPMENT NEWS

Detroit Tap and Tool Precision Tappers Provided With Single or Multiple Tapping Heads

Design of this LTM series light-duty machine permits mechanism to be raised or lowered on the column



Heavy duty series HTM permits use for cutting oil grooves and long taper lead tapping

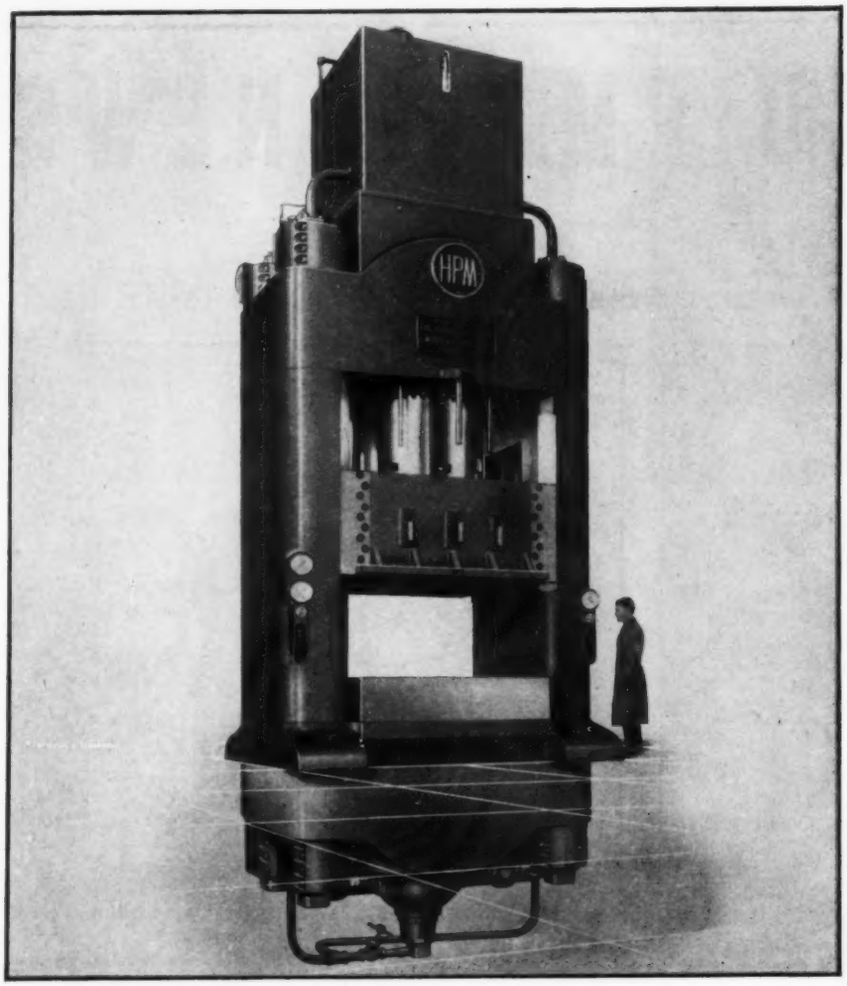
Special high production precision tapping machines, a light duty series LTM, and a heavy duty series HTM, have been announced by Detroit Tap and Tool Co., 8432 Butler St., Detroit, Mich. Both types are provided with either single or multiple tapping heads. The line of machines is featured by the use of a leadscrew to assure accuracy without requiring the leadscrew to drive the tap. The leadscrews operate in adjustable split bronze nuts of exceptional size, designed for ease in adjusting to eliminate backlash and to take up for wear.

The design of the light duty tapping machine is such that the complete tapping mechanism may be raised and lowered on the column through a worm and rack and pinion mechanism for adjustment of the height to the individual operation. The maximum stroke of the machine is 6 in., controlled by adjustable trip dogs and limit switches. Combined with a reversible type motor these provide automatic operation through the tapping and return stroke cycle. A cone pulley and double V-belt drive provide three spindle speeds, ranging from 100 to 400 r.p.m. A spring-loaded adjustable safety clutch included on the drive reduces possibility of tap breakage. This machine may be equipped with a multiple tapping head which may also be swiveled horizontally through an arc to 90 deg. for tapping in various positions in the fixture. To change the light duty machine for tapping different pitches it is only necessary to remove the dust cap and one screw. The leadscrew and nut assembly can then be removed and replaced as one unit.

The heavy duty tapping machine has a self-contained head, a welded steel base and a riser between them. The machine height can be varied by the selection of proper riser height. Positive drive is provided from a direct-coupled reversing motor up to 15 hp. capacity. A shear pin and flexible coupling protect the machine from motor vibration, work spoilage and tap breakage. The maximum stroke is 8 in., permitting the machine to be used for cutting oil grooves, long taper lead tapping and so forth. Operation is controlled by adjustable trip dogs and limit switches. The machine completes the tapping stroke, reverses and returns to starting position before stopping. A floating holder is designed which allows the taps to float horizontally only, without end play.

H-P-M Fastraverse Press Does Deep Plate Drawing

For deep drawing heavy steel plate to a depth of 18 in. the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has announced the H-P-M Fastraverse press, embodying a 3,500-ton downward act-



ing die platen and 1,000-ton hydraulic die cushion. This die cushion press may be operated on varied lengths of stroke and at full pressure capacity of 7,000,000 lb. for any distance. With the die cushion idle the press can be used for single action pressing. No compressed air or other outside pressure source is required to operate the die cushion. The intensified downward acting movement of the main press slide produces the necessary resistance force for holding the blank.

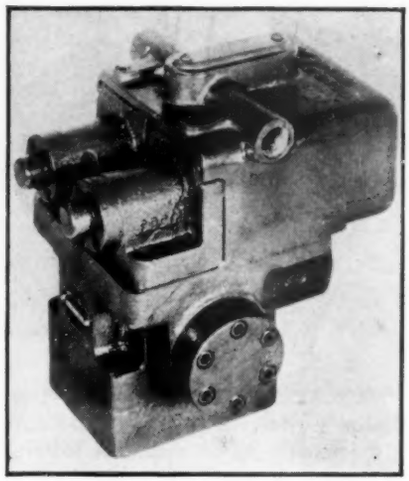
Two main slide pressure ranges, medium to 1,000 tons, high from 1,000 to 3,500 tons, are permitted by the H-P-M compound press ram. These two pressure ranges can be applied in sequence through the press cycle, or independently. This ram system has been found beneficial when a large part of the pressing stroke can be accomplished with medium pressure and only high pressure is required for final forming.

The closed circuit operating system provides complete control of all press ram movements without an operating valve. The press ram is reversed by reversing delivery of the hydro-power radial pump. The press has manual, semi-automatic or full automatic operation. Prefilling and exhaust of the main cylinder during rapid traverse ram movements is provided for by the Fastraverse principle of press operation. Shipping weight of the press is 521,600 lb.

Hydraulic Four-Way Valve Permits Change-Over Operation

Hydraulic Hi-Speed Co., 5438 Tireman Ave., Detroit, Mich., has developed an improved four-way valve featuring closed or open center operation by a slight mechanical adjustment. The unit permits a change to a different type of operation without replacing the valve and is suitable for use on a machine tool, production oven or wherever spring centered, four-way valve operation is required.

The main valve spool is operated hydraulically by pilot valves, normally spring offset. To produce a full range of valve operation these in turn are activated by the solenoids. In addition, when adjusted for closed center, de-energizing the solenoids blocks all ports. When adjusted for open center, de-energizing the solenoids blocks the cylinder ports but leaves pressure open to the tank. The use of open center permits bypassing of oil, conserving horsepower and reducing heat transfer during a long idle period. Three models of valve are available, 10, 18 or 28 gal. per min. capacity, with a maximum recommended working pressure of 2,000

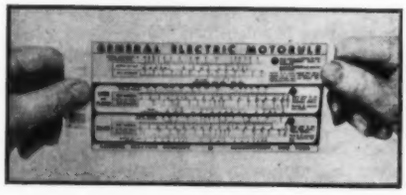


lb. per sq.in. The valve is furnished with subplate and solenoids in choice of voltage and current characteristics. The unit contains an integral dumping valve.

General Electric Motorule Computes Cutting Tool Power

The Motorule has been introduced by General Electric Co., Schenectady, N. Y., for calculating cutting tool power requirements on lathes, milling machines, drills and planers and can help in the selection of motors for machines formerly driven from line shafting. It has been designed along the lines of an engineer's slide rule.

In using the Motorule, reference is first made to a convenient table of



constants printed on the back for selection of the constant for the particular type of metal to be cut. By setting the scales to the known cutting speed, feed and cut the user arrives at the cutting power required.

Acromark Motor Driven Marker Will Ink Small Tubular Parts

Ink marking of tubular parts, rings, couplings and other small parts can be accommodated on the motor driven No. 49 marking machine recently introduced by Acromark Corp., 9-13 Morrell St., Elizabeth, N. J. The part is placed on a protruding mandrel by hand and the rotating die imprints the mark, after which the part is automatically ejected. Marking speed can be set to suit the feeding speed.

The ink is a liquid dye with an acid content for adhesion to the metal. It is claimed to remain permanent in salt

Announcing

A Series of 6 TRAINING FILMS

For your use in the training of new men, apprentices, and personnel being converted to war work

on DESIGN, BRAZING, APPLICATION, GRINDING OF CARBIDE TOOLS

We announce—for use in your plant—a series of six training films covering the fundamentals of carbide tool manufacture, design, brazing, application and grinding. Based on more than a decade of experience in the art of cemented carbide use, the films are designed to speed the training of new men, apprentices, and those being converted to carbide tool use in the metal working industry. Also suitable as "refresher courses" for those with working knowledge of carbide tool use but who wish to review the latest techniques. Technically known as "film strips" —containing illustrations and explanatory text—these films are designed for step-by-step training in the following subjects:

Not Motion Picture
Carboloy trainin films are technicall known as "filt strips", or silent slid films (35mm), cor taining illustration and explanatory tex for detailed trainin purposes.

SUBJECTS

Film No. 1—"WHAT IS CEMENTED CARBIDE?"

Designed to provide a knowledge of what cemented carbide is, physical characteristics, and how made. Valuable as a basis for understanding reasons for recommendations in subsequent films.

Film No. 2—"DESIGNING CARBOLOY TOOLS"

Reviews for tool designers, the special requirements necessary in designing tools with carbide tips. Covers tool styles, tip and shank sizes, rakes, etc., for single point tools.

Film No. 3—"BRAZING CARBOLOY TOOLS"

Detailed, step-by-step procedure for torch brazing carbide blanks to steel shanks. Includes brazing of single and multiple point tools, how to renew worn-out H.S.S. cutters with carbide tips, etc.

Film No. 4—"CHIP BREAKERS"

Shows how to determine most efficient chip breakers for carbide steel cutting tools; how to adjust to meet individual conditions; and step-by-step procedure for grinding rapidly and accurately.

Film No. 5—"GRINDING CARBOLOY TOOLS"

Step-by-step grinding procedure for single point carbide tools from brazed, damaged and ordinary dulled states. How to rough rapidly and finish accurately. Equipment, wheels, accessories.

Film No. 6—"PUTTING CARBOLOY TOOLS TO WORK"

Important for the operator applying carbide tools. In three parts: Part I—Putting tool on machine. Part II—The machine. Part III—Trouble shooting. What to do when the job doesn't "click".

AVAILABLE FOR PERMANENT USE AT COST OF PRINTS ONLY

So that industrial concerns and educational institutions may incorporate these films as a permanent part of their war training program, prints are available for purchase at approximate print cost of $20.00 for set of 6. (Entire cost of film production has been absorbed by Carboloy Company.) One complete set of six reference manuals and one instructor's manual included.

CARBOLOY COMPANY, INC., DETROIT, MICH.

(Sole makers of the Carboloy brand of cemented carbides)

Chicago · Cleveland · Los Angeles · Newark · Philadelphia · Pittsburgh

CARBOLOY TRADEMARK **CEMENTED CARBIDES**

MAIL THIS COUPON TODAY!

Carboloy Company, Inc.
11149 E. 8 Mile St., Detroit, Michigan

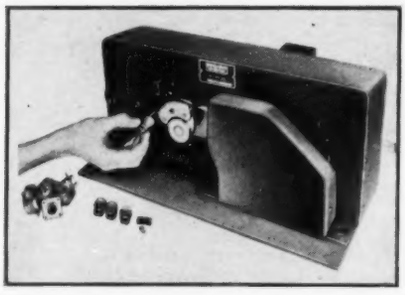
- ☐ Send free booklet describing Carboloy Training Films.
- ☐ Reserve 1 set of 6 films @ $20.00, including set of film reference manuals and instructor's manual. Order follows.

Name_____ Title_____

Company_____

Company Address_____

City_____ State_____



water, gasoline and oil. Alcohol is a solvent for this ink. The inking fountain arrangement has sufficient capacity for a production run of about six hours. A gear reduction motor drive is inclosed in the back of the machine which drives the marking roll, ink fountain and automatic ejector. The motor is standard 110 to 220 a.c. phase and plugs into a light circuit.

The marking dies are made of synthetic rubber and are interchangeable. A simple adjustment for marking position of various sizes is provided.

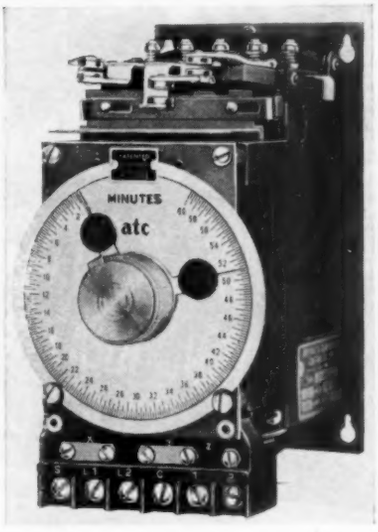
ATC Cycle-Progress Timer Has Several Dial Selections

An improved ATC Cycle-Progress timer for controlling such applications as automatic quenching, die casting machines, molding presses, automatic mixing and soaking period control has been developed by ATC Company, Inc., 34 East Logan St., Philadelphia, Pa.

Dials may be selected from 15 or 60 min., 2, 10, 20, 40 or 60 hr. The red pointer, which is shown at zero in the illustration, indicates progress of time cycle. The other pointer is set by a knob to the desired time limit. Long range of visibility is provided in the 3⅞-in. dial.

The load and timer motor clutch circuits are normally wired independently but can be wired together. Timers may be supplied for resetting or nonresetting action upon power failure.

A one-piece molded bakelite terminal block has been incorporated in the new model which accommodates bridge positions as well as external wiring to clearly marked screw post terminals. In addition a leaf spring contact is provided to assure positive make-break contact action.



Philips Shell Case Degreaser Will Clean Inside and Outside

An automatic shell degreaser for handling 20 to 75 mm. shell has been announced by Phillips Mfg. Co., 3475 West Touhy Ave., Northtown Sta., Chicago, Ill. The interior as well as the exterior of shell casings can be degreased with this machine. An ingeniously arranged conveyor belt equipped with swiveled carrier basket-pockets automatically and continuously places the shell in position for forcing the solvent in the shell interiors under pressure. Solvent injection is at an angle to avoid the forming of air pockets and to insure thorough flushing. The degreaser is portable and requires neither steam, water nor gas connections. For larger shell, stationary degreasers are available for handling sizes up to 155 mm.

After the shell case has been carried downward through the degreasing vapor, when in position above the nozzle, solvent is injected under pressure. The liquid drains out as the shell rises on the conveyor, and then the shell passes through a hot vapor zone and reaches the loading and reloading station near the top of the unit drained and dry. Shell cases open at both ends follow the other path which provides for horizontal travel over a section where two sets of spray heads inject solvent under extra pressure required for a thorough flushing and cleaning of the interior.

The conveyor and its driving motor form a removable section mounted in the upper portion of the housing. The solvent pump assembly on the lower side of the housing is designed for continuous operation. Overheating is controlled by thermostatic switches.

Ohio Carbon Burnishing Tool Removes Commutator Glaze, Film

A commutator and ring burnishing tool to remove glaze and film from the commutator has been announced by Ohio Carbon Co., 12508 Berea Road, Cleveland, Ohio. The tool is constructed of nonconductive materials, thus there is no danger to the machine or operator. It is furnished in styles to accommodate any size ring or commutator.

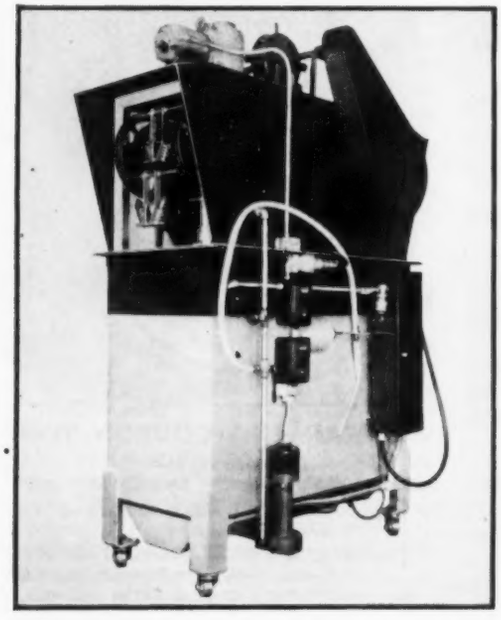


Photo Courtesy International Business Machines

Modern inspection by optical projection saves time and money

Jones & Lamson Comparators are available in Pedestal, Bench and other types to meet every need in the field of Inspection by Optical Projection. We shall be pleased to study your problems and apply to them the accumulated experience of more than twenty years in this field.

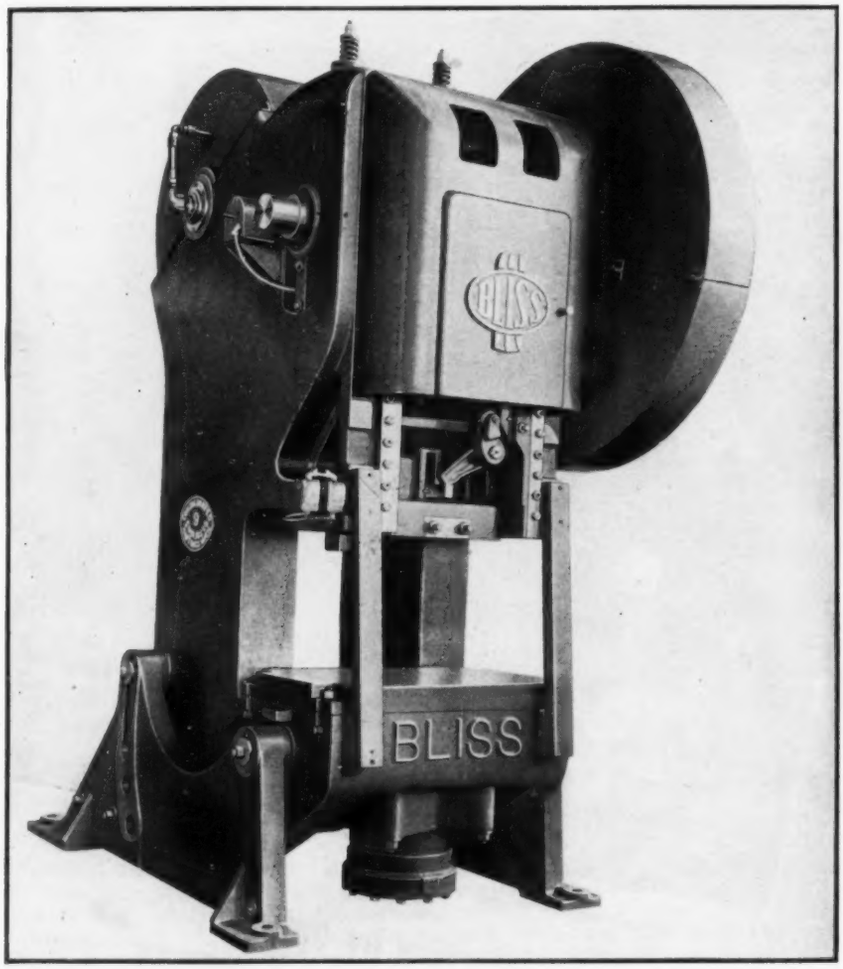
Profit-Producing J&L *Machine Tools*

JONES & LAMSON MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of: Ram and Saddle Type Universal Turret Lathes · Fay Automatic Lathes · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers.

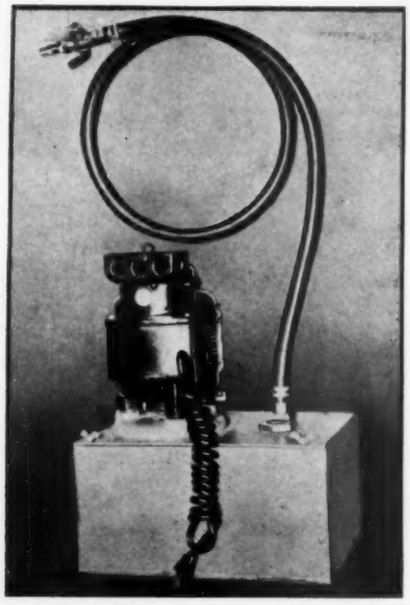
Bliss-Consolidated No. 9 Inclinable Press Permits Completed Work to Fall to Rear of Machine



E. W. Bliss Co., 53 St. and Second Ave., Brooklyn, N. Y., has announced the 150 ton Bliss-Consolidated No. 9 inclinable press of the geared type, having the main working parts either inclosed within the housing or in guards designed for the safety of the operator. It is equipped with a Marquette pneumatic cushion and driven by a 15-hp. motor mounted inside the frame.

This press can be inclined 39 deg. in order to permit the completed work to fall to the rear of the machine. To keep deflection at a minimum heavy removable tie bars are used in front of the frame. All of the heavily loaded parts are made of special high strength alloy material.

The machine features inclosed mechanism, including clutch, flywheel and brake, clutch operating valves and electrical controls together with a spring counterbalance for the slide. The necessity for setting correct knockout position at the rear of the press has been eliminated by a new type lever and cam operated slide with single adjustment at the front of the machine. The open-back gap frame permits feeding of the strip stock either right to left or front to back.



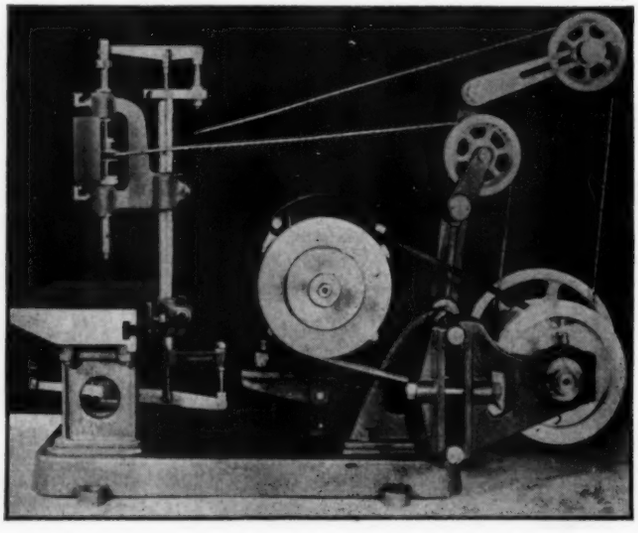
Spiegel-Spray Coolant Pump Is Portable, Non-Clogging

A line of portable coolant pump systems known as Spiegel-Spray has been introduced by G. B. Spiegel Corp., 3958 South Calumet Ave., Chicago, Ill., which range in capacities from 150 to 1,500 gal. per hr., with tanks from 3½ to 15 gal. The pump is a non-clogging centrifugal unit with no gears or close-fitted parts, no metal to metal contact. It is fitted with a removable strainer and an accurate flow control valve which delivers the required amount of coolant and a spray nozzle delivers the coolant exactly where needed.

Blake Sensitive Drill Press Has Finger-Tip Control Spindle

A super sensitive drill press for extremely small drills and other tools has been announced by the Edward Blake Co., 634 Commonwealth Ave., Newton Centre, Mass. Sensitivity is attained by balancing the spindle by means of the vertical component of the belt tension.

Each spindle has an independent finger-tip control and each one may be run at an independent speed to suit the size and type of tool which is being



Each spindle of this press may be run at independent speed to suit type and size tool used.

WAR PRODUCTION- 33½ HOURS PER DAY!

SUNOCO EMULSIFYING CUTTING OIL

increased output 40%...stepped up tool life...improved finish

It takes bullets to win battles, and American ingenuity is finding ways to set amazing records in the race for arms production.

For example, in a plant turning out bullet-assembling machines, excess heat on tools and work, poor finish, and operators' skin complaints were restricting production. A Sun Oil Engineer — one of those capable Doctors of Industry — was called in to improve conditions. He recommended a change in cutting fluid . . . to Sunoco Emulsifying Cutting Oil. Now they're using Sunoco . . . and rate of production has increased 40% — equivalent to an extra 9½ hour shift every day! Finish has also improved, and skin trouble vanished.

Sun Doctors of Industry and Sunoco Emulsifying Cutting Oil stand ready . . . willing . . . and able to help you step up production in your shop. For helpful case histories of what they have accomplished for other leaders in the metal working industry, write for your free copy of "Helping Industry Help America."

SUN OIL COMPANY • Philadelphia

Sun Oil Company, Ltd., Toronto

SUNOCO

LET'S GO! U.S.A. KEEP 'EM FLYING!

SUN PETROLEUM PRODUCTS HELPING INDUSTRY HELP AMERICA

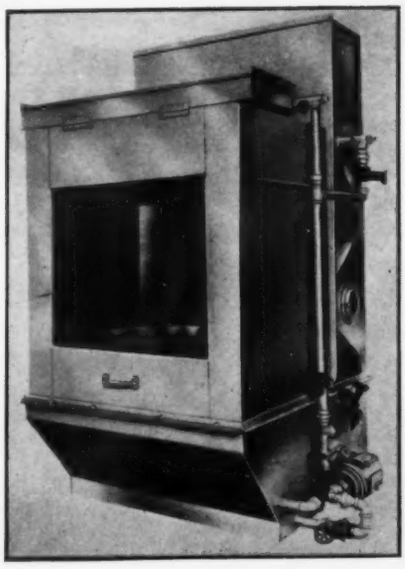
used and the material to be cut. Machines with one, two, three and four spindles can be furnished. Two spindles for each spindle mount are included in the standard equipment, one for Jacobs chuck and the other with a tapered hole for tapered shanks.

The machine has a standard range of 8 speeds from 3,000 to 23,000 r.p.m., which gives the proper surface speeds on drills from 0.004 in. or smaller to 1/16 in. diameter.

Aqua-Restor Water-Wash Booth Affords Fire Hazard Protection

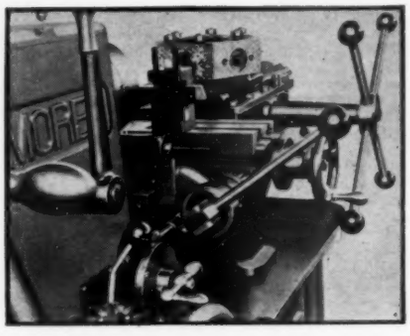
Announcement of the Aqua-Restor water-wash paint spray booth, which requires only low horsepower pumps, has been made by Mayer Manufacturing Corp., Aqua-Restor Div., 45 Division Place, Brooklyn, N. Y. Fire hazards are reduced and employee health is protected by use of this equipment.

The super-turbulent water-washed walls provide efficiency in spraying operations of all sizes and types through continuous pressured flow. The unit has no moving parts or nozzles. Used water may be drained directly, or can be arranged for pumping for distant disposal. The booth is equipped with fluorescent lighting and turntable. Single or multiple units are available.



Morey Machinery Turret Lathe Has Combination Cross-Slide

An improved quick-acting combination screw and lever cross-slide has been announced by Morey Machinery Co., Inc., 410 Broome St., New York, N. Y., for its No. 2G turret lathe. The operator can immediately use either type of feed, or the screw feed in combination with the lever feed. By one movement of a clutch either the lever or screw movement can be selected. No setscrews for tightening or loosening are used.



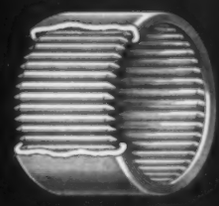
Leach Makes External Grinder Which Handles Small Parts

An external grinder for small parts up to 7 in. in dia. and 11 in. in length has been introduced by H. Leach Machinery Co., 387 Charles St., Providence, R. I. Six table feeds are available ranging from ⅜ to 3⅜ in. per min. The wheel spindle speed is 2,750 r.p.m. Both wheel head and spindle motors operate on 60 cycle, 110-220 volt, wheel head motor being 1 hp. and spindle motor being ¼ hp. The micrometer adjusted tailstock has spring action. The machine occupies a working space of 51×32 in., and weighs 750 lb. net.

Moto-Sweeper Cleans Floors, Picks Up Metal Turnings

A Commander model Moto-Sweeper for cleaning up factory floors has been introduced by the Moto-Mower Co., 4600 Woodward Ave., Detroit, Mich. It turns right or left under its own power by means of a separate clutch on each wheel of the tractor controlled at the handlebar. Heavy metal turnings are easily picked up by use of the sweeper. Other models include motorized units, a spray which can be adjusted to lay dust on the floor without wetting it, and a heavy bumper for the larger models. The Commander may also be adapted to a snow plow.

...AND IN AMERICA'S WAR PRODUCTION MACHINERY



IN OTHER YEARS, production machinery had a comparatively easy time of it—even for this country, birthplace of mass production. But nowadays, plant equipment is subjected to extremely heavy intermittent loads, hums faster than in any peacetime period, without letup.

To keep the nation's war production moving at top speed around the clock, tougher materials had to be developed...many machine parts redesigned. But the only "change" industry required of the Torrington Needle Bearing was its conversion to war production. In the heavy-duty machinery of America-at-war, this unique bearing is again proving its adaptability—in applications where its definite advantages mean more than ever.

Its low coefficient of friction is assuring smooth performance...its high capacity and efficient lubrication are reducing the need for replacement or maintenance attention, enabling management—through steadier production—to turn out greater quantities of war equipment. From the standpoint of the machine builder, the Needle Bearing's small size, saving space and critical materials, and its remarkable ease of installation, cutting assembly time, mean faster delivery of production machinery to wartime assembly lines.

And so it is easy to see why the Needle Bearing was one of the first machine parts to "change over" and why, too—with the war production program increasing in volume and intensity—no further change has been necessary.

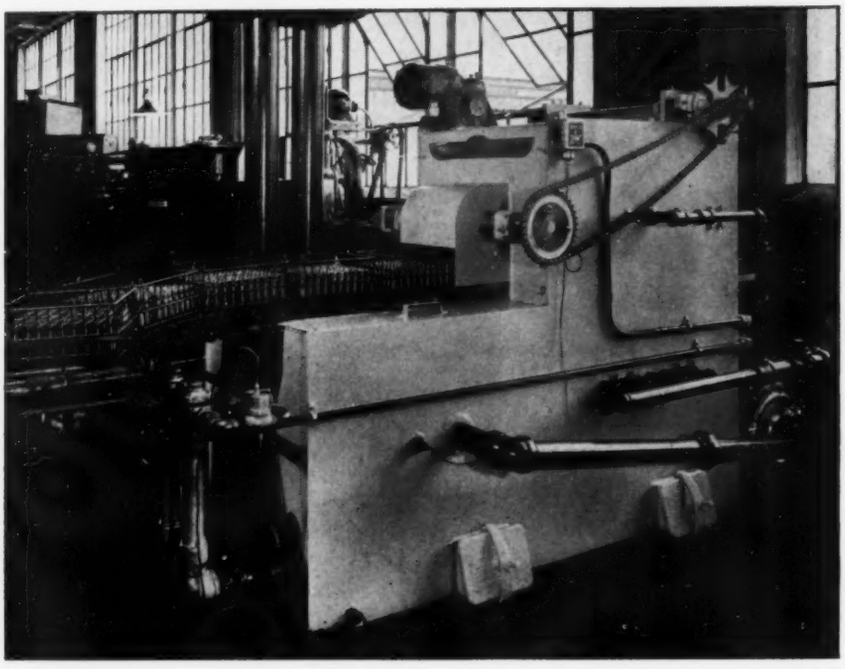
IN ADAPTING *the advantages of the Needle Bearing, the experience of Torrington's Engineering Department is at your disposal. Information on capacities and sizes is given in Catalog No. 105. We invite you to write today.*

THE TORRINGTON COMPANY
TORRINGTON, CONN., U. S. A. • *Est. 1866*
Makers of Needle and Ball Bearings
New York Boston Philadelphia Detroit
Cleveland Seattle Chicago Los Angeles
San Francisco Toronto London, England

TORRINGTON NEEDLE BEARING

Every feature fills a wartime need

Barry-Wehmiller Metal Cleaner Handles Varied Shaped Parts



Announcement has been made by Barry-Wehmiller Machinery Co., 4660 West Florissant Ave., St. Louis, Mo., of the B-W metal cleaner which will handle a variety of shapes and sizes of parts, both small and large. The small parts are usually carried through the machine in the same baskets which are used throughout the process of manufacture. Suitable conveyors carry the large parts individually.

In cleaning, the parts are conveyed through the machine and subjected to powerful sprays of cleaning solution of suitable temperature and strength. They can be completely dried before emerging from the machine if necessary. Either alkali or solvent type cleaners may be used. Skimmers permit continuous or periodic removel of contamination from the solution.

Complete operation of the machine is by one pushbutton. The heating equipment is automatically controlled and can be supplied to use gas, electricity or steam. The conveyor turns may be installed close to either end of the machine.

Other types of cleaners are available for submerged cleaning not adapted to the spray method, which also provide continuous automatic operation.

Larkin Welding Transformer Has Built-In Capacitors

A line of heavy duty a.c. welding transformers has been announced by Larkin Lectro Products Corp., 220 Taaffe Place, Brooklyn, N. Y., which are available in sizes 300, 400, 500, 800, 1,000 and 1,200 amp., for 220, 440 and 550 volts, for single, dual and multiple operation.

The amperage adjustment of this unit is by continuous glide-control with the front of the case featuring a small calibrated scale. Identical welding characteristics at all heats are included among the control features, and built-in capacitors are provided.

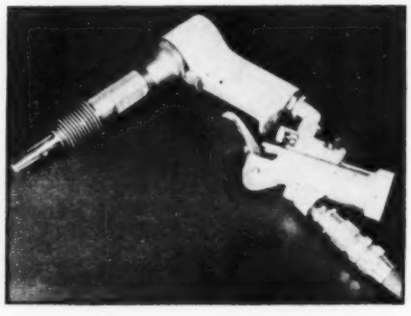
The machine has a heavy cast-iron head, solid case and casters for moving the transformer around. The models from 500 to 1,200 amp. are also equipped with eyebolts imbedded in the castings for lifting by crane.

Murray Time-Air Rivet Device Determines Proper Time Cycle

The newly developed Murray Time-Air for determining proper riveting time cycle now being manufactured by the Chicago Pneumatic Tool Co., 6 East 44 St., New York, N. Y., is a light, compact, precision unit which can be controlled automatically or manually when attached to the handle of a portable riveting gun.

When used automatically, the trigger is depressed fully and the timer delivers a predetermined time cycle and then stops, accurately producing rivet bucktails of uniform height and diameter. Time cycles are set by turning a small adjustment dial, and pressure control may be regulated for soft or thin material. The hammer operates as long as the trigger is held slightly back, which permits trim-up or an occasional longer cycle.

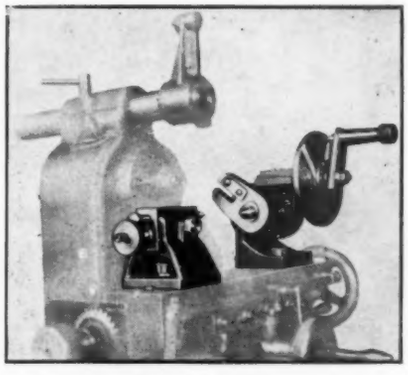
The operator can set the time cycle on a production panel without loss of time or rivets by using the trim-up



feature and gradually adjusting the dial until the proper time cycle is reached. The device can be used also on pedestal riveters, operated by a foot pedal control.

Jefferson 6-In. Tilting Head Has 5 Deg. Headstock Swing

A 6-in. tilting dividing head with three indexing plates and tailstock has been introduced by Jefferson Machine Tool Co., Fourth, Cutter and Sweeney Sts., Cincinnati, Ohio. The headstock tilts 5 deg. below horizontal and 5 deg. past perpendicular; swivel is graduated up to 100 deg. The three indexing plates divide all numbers to 50, all even numbers to 100 except 96-T. The spindle has take-up collar for end thrust and a 5 in. hole. The head is furnished with a right-hand mount, but can be supplied with left-hand if desired.



Double-end TOMAHAWKS *.....do Double duty.....*

When ordering special forming tools it is frequently a good idea to buy them double-end. You can thus get two tools in one, save precious high speed steel and double the life between grinds.

Just turn the tool around the first time it needs sharpening.

Such tools also reduce grinding time and cost, since it takes less time to grind both ends of the tool at one time than to grind each end separately at different times.

It is not always possible to use double-end forming tools of course. You want to be sure that your tool support will protect the other end of the tool.

But it's worth looking into. There are many such **TOMAHAWK** tools in effective use today.

Send for "Streamlined" Catalog No. GT-42
on your company letterhead.

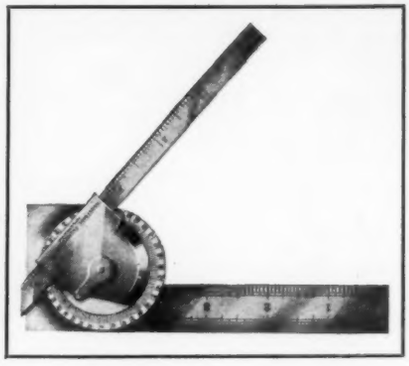
GENESEE TOOL COMPANY

FENTON, MICHIGAN

★ Registered Trade Mark

C-F Giant Welding Positioners Have Revolving, Tilting Table

Two new models of giant C-F welding positioners have been announced by Cullen-Friestedt Co., Chicago, Ill. The Model 200 has a capacity of 20,000 lb. 20 in. away from table, 8 in. off center; and the Model 300 has a capacity of 30,000 lb. 24 in. away from table, 18 in. off center. These positioners are mounted on a single pedestal which is adjustable for height. The table revolves completely around and tilts to any position up to, or down to, 135 deg. off horizontal. The equipment is operated by pushbutton panel so that the welder can swing and tilt to any position without the use of cranes.



Industrial Xactor Protractor Measures Small or Large Angles

An improved Xactor protractor has been announced by Industrial Engineering Co., Inc., Board of Trade Bldg., Chicago, Ill. Small or large surface angles such as those ground in toolbits can be measured with this instrument without the aid of any attachments. By sliding the arm to suit the conditions the taper on shallow blind holes or tooth angles on broaches can be measured. The sliding arm is graduated for measuring the exact depth of holes. Degree graduations are so arranged that the component angle can be read directly as well as the angle required.

The protractor is light weight and thin, having no projecting setscrew or other clamping devices and suited for carrying in the pocket.

Davis Laminated Solenoids Serve General Industrial Use

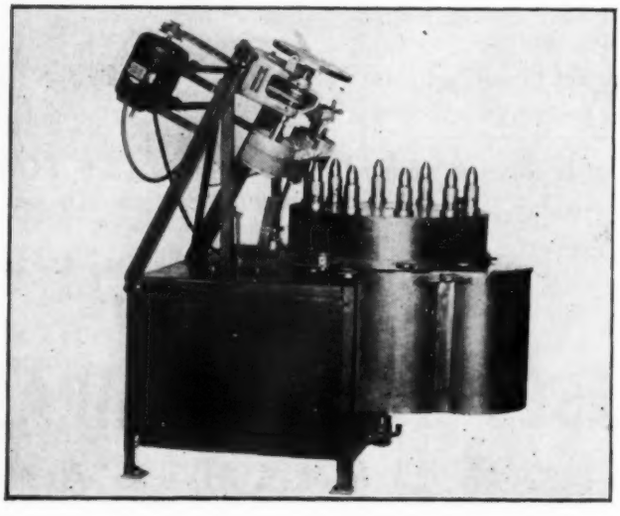
Pull type and push-pull type laminated solenoids for hydraulic valves and general industrial purposes have been developed by Dean W. Davis & Co., Inc., 549 West Fulton St., Chicago, Ill. Coils

(*Continued on page* 1474)

Leiman Shot Tip Polisher Has Automatic Rotating Wheel

A machine for polishing 37 mm. shot tips, which has been produced by Leiman Bros., 136 Christie St., Newark, N. J., is so arranged that a number of rotating chucks mounted on a rotating wheel hold the parts to be polished. The chucks are loaded at a point where they automatically stop rotating. The rotating wheel indexes intermittently, bringing the work against the running abrasive belt for polishing.

The abrasive belt, driven by a separate motor, has a range of three speeds. Two small motors individually drive the chucks and the wheel. The driving mechanism is inclosed in a dust-tight base. This machine occupies a floor space about 38×45 in. and about 52 in. high.

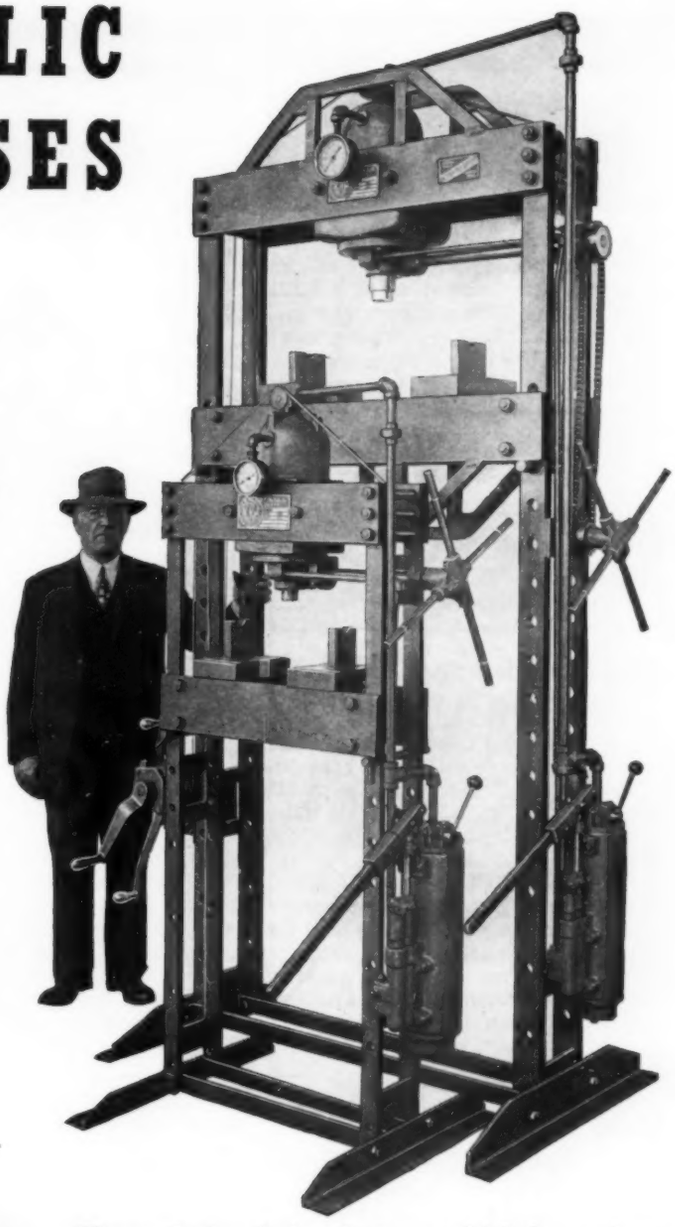


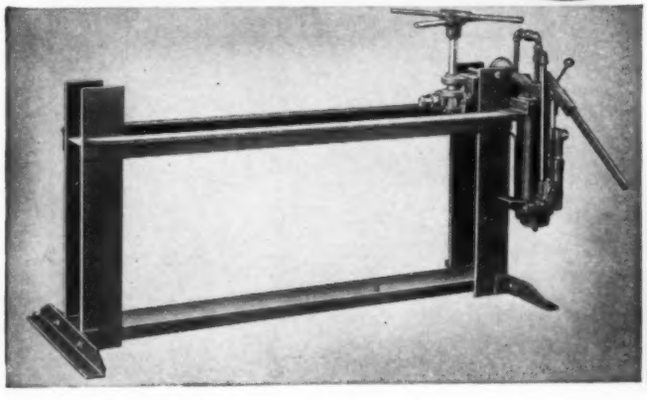
Rotating wheel indexes work intermittently against the belt

KRW HYDRAULIC ARBOR PRESSES

for War Production

Standard Hydraulic Presses in 25, 50 and 75 ton capacities. Special Presses engineered for specific war production needs.

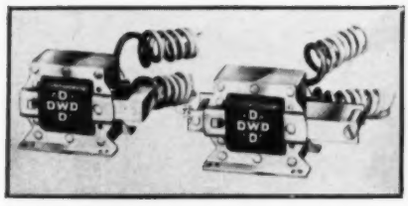




The exclusive design features which have given KRW Standard Presses their reputation for speed and efficiency are available to war production manufacturers who require presses of special design. The illustration above shows a *special*, extra high 75 ton KRW Press in comparison with the Standard 25 ton unit. Opposite illustration shows a special, 4-man operated, air-oil Press used for bomb loading. Press illustrated at lower left is a special horizontal design built to meet customer's requirements.

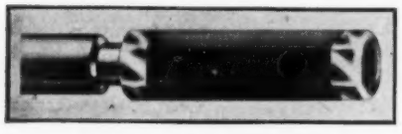
KRW also builds bench-type Arbor Presses in 1/2, 1 and 3 ton capacities.

K. R. WILSON
10 LOCK ST., BUFFALO, N. Y.



may be paper section wound, cloth-taped, and treated with synthetic resins to make them impervious to coolant or cutting oils. The plunger and frame are precision built to insure quiet operation.

These solenoids can be used for either direct or remote control on operations in which short, quick thrusts are required. They can be furnished for any voltage and 25 to 60 cycles.

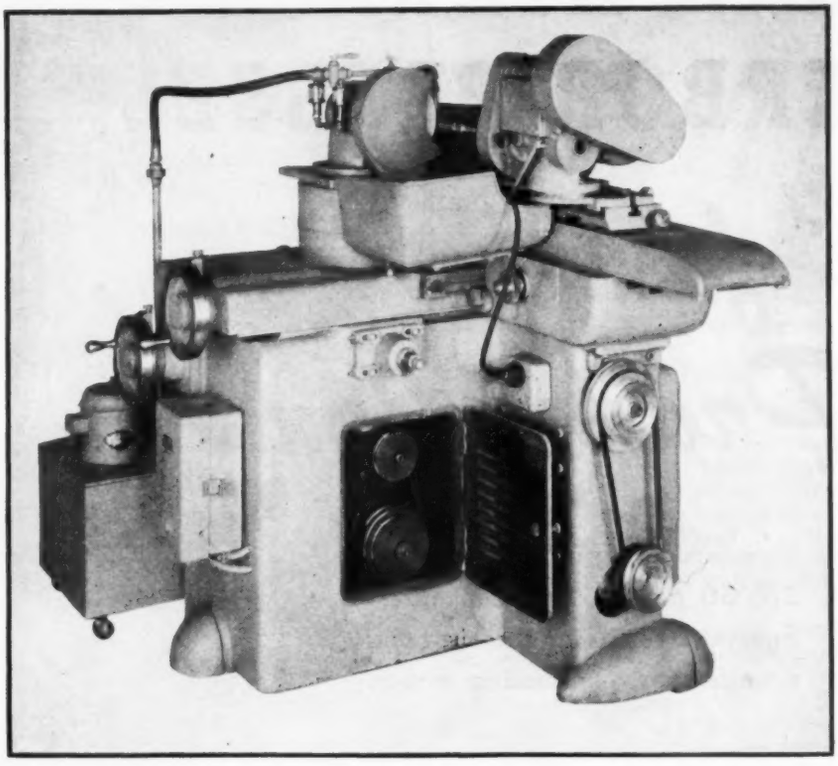


Federal Taperlock Gage Handles Now Made of Plastic Material

Plastic gage handles to relieve the use of metal in this product have been developed by the Federal Tool Corp., 412 North Leavitt St., Chicago, Ill. The use of plastic in these new Taperlock handles allows a lighter touch and reduces the possibility of fatigue from long continued use. They are marked with the same lettering stamps used for marking metal handles.

The handles are accurately made to standard dimension and are available in any quantities.

Covel Cutter and Tool Grinder Has Flexibility of Operation



Covel Manufacturing Co., Benton Harbor, Mich., has introduced the No. 22 universal cutter and tool grinder. The working units are controlled by dials which move at a slight touch but remain rigidly in place until the job has been completed.

The cross-feed screw is disconnected by a wedge-shaped cam which is operated from the front of the grinder, enabling the saddle to move by chain and sprocket action. The screw can be connected to the saddle at any point in its travel by tightening the small knurled handwheel in front of the

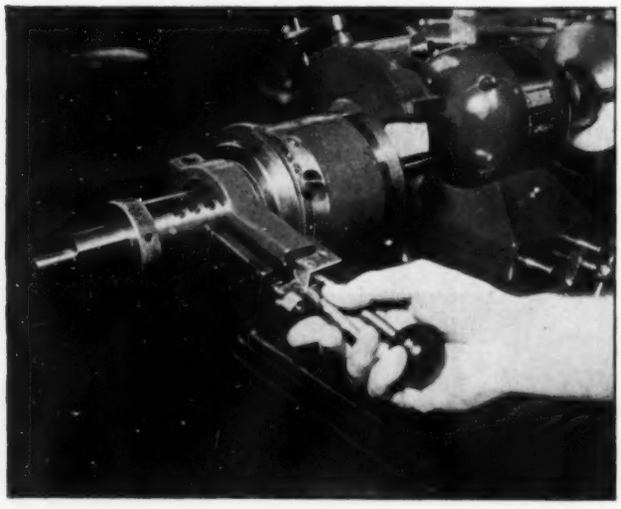
(*Continued on page* 1476)

Detroit Tap Reconditioner Handles Sizes Up to 1¼ In.

Improvement in the tap reconditioner made by Detroit Tap and Tool Co., 8432 Butler, Detroit, Mich., includes an increase in its capacity to handle all sizes and types of taps up to 1¼ in. dia., including long shank tapper taps. The machine is designed to enable spiral pointing and polishing of spiral points in addition to tap chamfering, and to decrease tap consumption by increasing the useful tap life by simple reconditioning operations. Several improvements have also been made to increase the ease of reconditioning on this machine.

Hewitt Makes Conveyor Belt Of Non-Oil-Resistant Rubber

An all-synthetic rubber conveyor belt has been announced by the Hewitt Rubber Corp., Buffalo, N. Y. The product is made from Buna S rubber which is non-oil-resistant and consists of a combination of butadiene and styrene.



Mrs. Parker's cooking utensils are making it hot for the Japs

Thanks to the kind of planning that wins wars, the finest of everything goes to the fighting forces. So thousands of women whose hearts were set on outfitting their kitchens with Revere Copper-Clad Stainless Steel utensils are now treasuring the pieces they were fortunate enough to get before the war.

Treasuring them but using them—hard. For the same fine materials and manufacturing techniques that are making our military machine so tough have fortified Revere Ware utensils against years of the severe usage enforced by war.

The Revere plant where these "Kitchen Jewels" were made was able to change over smoothly and quickly to implements of war. Like all other manufacturing plants, it could rely on the Revere Technical Advisory staff for skilled help in methods of processing the unfamiliar copper alloys of wartime.

Every ounce of copper our country produces goes directly into the essentials of warfare. Fortunately, Revere is well equipped, with modern plants, improved machines, and advanced techniques to assume a heavy responsibility in the production of vital copper alloys. And Revere research is continually probing deeper into the secrets of copper to help develop still better, stouter arms for victory.

The Revere Technical Advisory Service functions in (1) developing new and better Revere materials to meet active or anticipated demands; (2) supplying specific and detailed knowledge of the properties of engineering and construction materials; (3) continuously observing developments of science and engineering for their utilization in production methods and equipment; (4) helping industrial executives make use of data thus developed. This service is available to you, free.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

EXECUTIVE OFFICES: 230 PARK AVENUE, NEW YORK

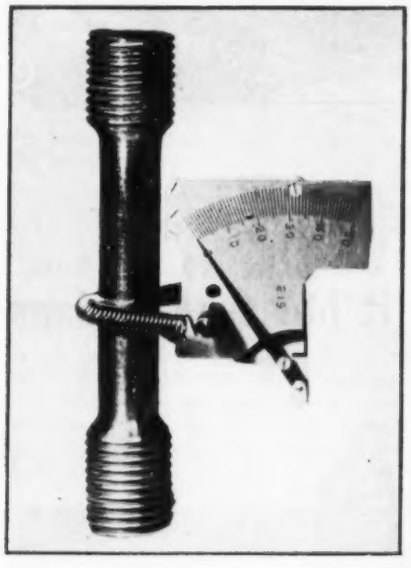
cross-feed screw. The micrometer adjustable throw-out stop limits the forward movement of the saddle, but can be thrown out of the way to permit the saddle to move forward again. Cross movement of the saddle is 8 in.

The ¾-hp. motor drives a countershaft through a V-belt, providing three quick change speeds for main spindle drive. This countershaft drives the spindle through another V-belt extending through the center of the column. Each belt has independent adjustment. The head swings 360 deg. and is equipped with a large graduated dial for accurate setting.

The longitudinal travel of the table is 24 in., vertical movement of the grinding wheel spindle is 7½ in. It swings work 30 in. long with right- and left-hand tailstock, and with the three speed headstock and right-hand tailstock swings work 24 in. long. The height of the grinder from the table to the floor is 41 in. and it occupies a floor space of 57×89 in.

Porter-Lipp Strain Gage Does Structural Testing

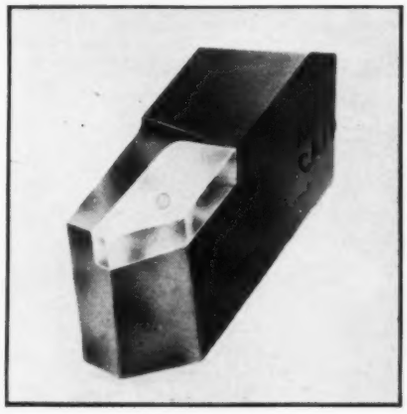
For structural testing the Baldwin Southwark Div. of Baldwin Locomotive Works, Philadelphia, Pa., has intro-



duced the Porter-Lipp strain gage. It is a light, compact, convenient, mechanical type of device, and graduated so that each division corresponds to a strain of approximately 0.0001 in. It has a readable accuracy of 0.00002 in. for gage length of 1 in. The overall dimensions are 1¾ in. and the unit weighs 4 oz.

McKenna Metals Offers Tools With Longer Tip On Lead Angle

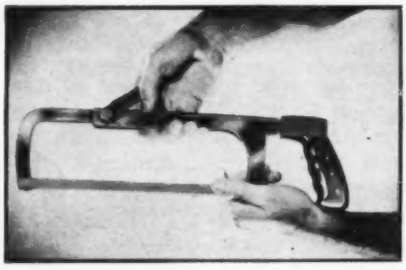
Styles 39 and 40 Kennametal tools have been introduced by McKenna Metals Co., 103 Lloyd Ave., Latrobe, Pa., which combine the lead angle or side cutting



edge angle with a tip longer than usual on carbide tools having a lead angle. These tools are particularly useful in shell turning where uniform forgings permit the depth of cut never to exceed the length of the tip having a lead angle. The chip breaker is ground only on the section parallel to this angle. The tools are available in sizes of ⅛×5/16×⅝ in. to ⅜×¾×1½ in., and also may be used for chamfering operations.

Victor Steel Hacksaw Frame Has Cam Action Lever Lock

A hacksaw frame with a cam action lever lock has been introduced by Victor Saw Works, Inc., Middletown, N. Y. The frame is made of heat-treated spring steel and a gun metal finish insures high resistance to rust, and is adjustable for 8, 10 or 12 in. blades by pulling out a single pivot pin, sliding the frame forearm in or out to desired length, and snapping the pin back into place. The blade may be repositioned to face in any of four directions



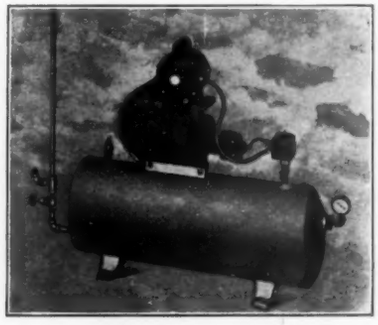
which is accomplished by placing it over either of two sets of fixed pins which are integral with the frame.

The handle is available in two styles, either straight, the Victor No. 30, or pistol grip, the Victor No. 20.

Bancroft Chemical Extinguisher Suited for Hazardous Spots

Introduction of a fire extinguishing chemical sprinkler system suitable for placement over boilers, furnaces, oil burners and certain hazardous spots has been made by Bancroft Chemical Sprinkler Co., 82 Foster St., Worcester, Mass. A pressure switch controlling the motor operates the system automatically. The air compressor maintains a constant pressure on the extinguishing liquid in the tank and pipe line.

In case of fire the heat melts the fuse-link causing the sprinkler head to open, permitting the liquid to be sprayed out onto the fire. This



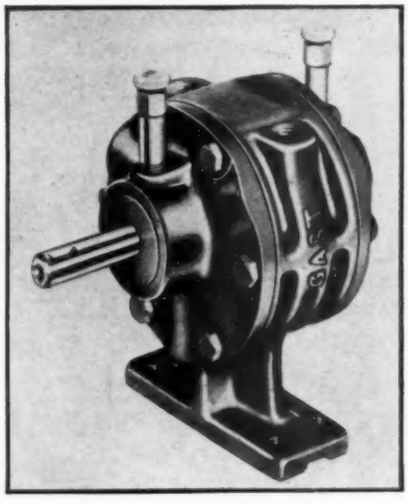
liquid is not injurious to cloth, does not freeze, rust or deteriorate. It will put out magnesium fires.

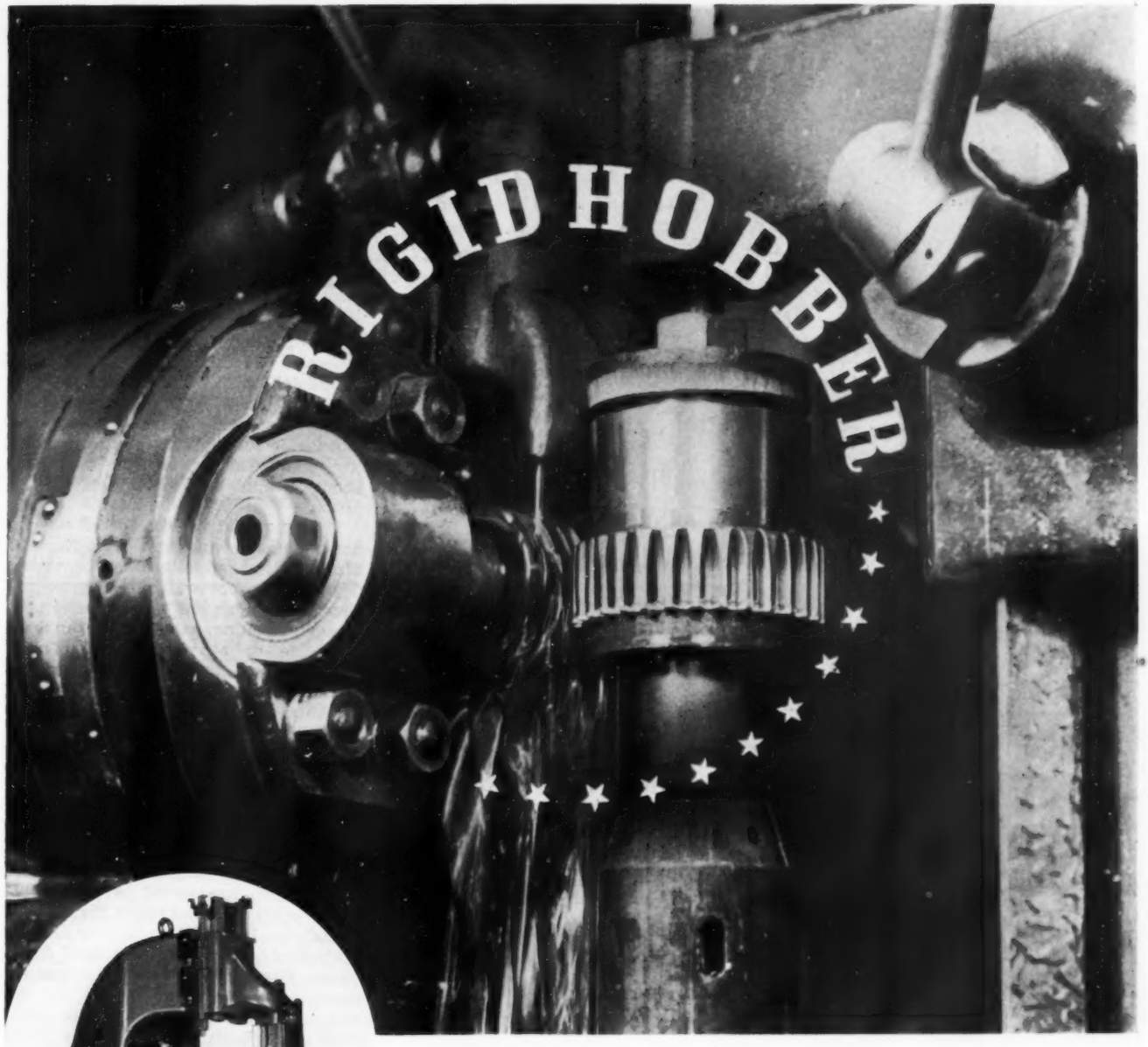
Upon contact with the flame, the extinguishing liquid vaporizes and forms a heavy blanket of vapor. This vapor consumes the heat, displaces the air and stops combustion.

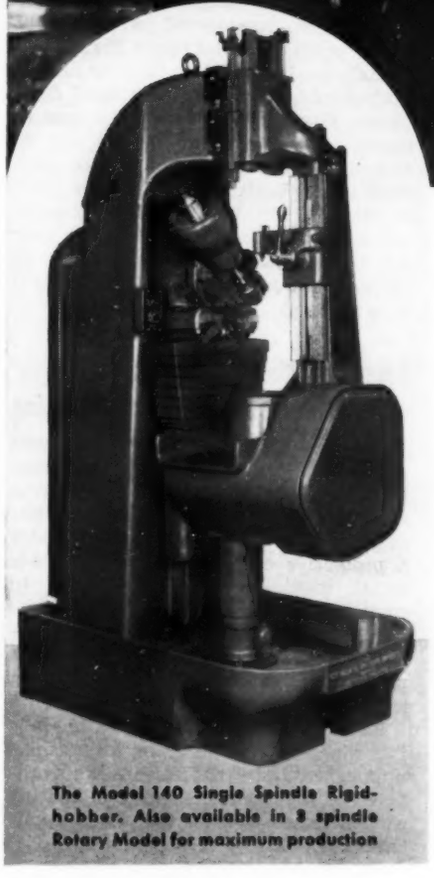
The unit is designed for use where the area of protection desired is about 10×10 ft. Its capacity, however, will permit a few additional sprinkler heads in other parts of the room.

Gast Produces Air Motors Which Are Explosion-Proof

An explosion-proof rotary air motor available in two sizes, Model 2 and Model 4, has been announced by Gast Mfg. Corp., Benton Harbor, Mich. Among the features of the motor are no reciprocating parts or springs, low maintenance, variable speed over a wide range, positive starting in any position, automatic take-up for wear and unusual compactness for power developed. These motors deliver from







The Model 140 Single Spindle Rigidhobber. Also available in 3 spindle Rotary Model for maximum production

VERTICAL Feed Provides RIGIDITY

Rigidhobber design is *VERTICAL* incorporating a moving workhead and stationary hobhead. This design gives both units positive support during the entire cutting operation and is universally recognized as providing maximum rigidity.

Another advantage of Vertical design is that chips naturally fall away from the hob and work spindle.

Complete information promptly furnished on request. Write today.

THE CLEVELAND HOBBING MACHINE CO.
CLEVELAND, OHIO, U. S. A.
Builders of RIGIDHOBBERS and RIGIDTURNERS

6 REASONS WHY THIS GRINDER IS THE BEST

CLOCK BEATER

● Now, when every man hour is so precious, you'll cheer the rapid, high precision performance of the DoAll which turns out all kinds of single or multiple extra-accurate grinding jobs ahead of time.

Above view in an Ohio plant shows grinding dove tail form tools for screw machines.

The DoAll is praised by grinding machine experts because of its supreme accuracy to size, flatness and parallelism.

In fact, the finish is so smooth and mirror-like that you can actually "wring" two flat surfaces together. The DoAll is adaptable to either wet or dry grinding, and comes in two sizes, with 7" or 10" wheel.

Write for complete details about this new and better grinder.

SAVAGE TOOL CO.
DEPT. AM, SAVAGE, MINN.

1/20 to 1 hp., and are fitted with ball bearings, all parts are accurately ground and self-adjusting shaft seals are used in place of packing.

NEW MATERIALS

Colonial Degreasing Solvent Is Not Explosive or Flammable

A degreasing solvent called cyclodiene hydrocarbon, for ferrous and non-ferr rous metals as well as other materials, has been announced by the Technical Processes Div., Colonial Alloys Co., Philadelphia, Pa. The work is dipped into this solvent at room temperature and is thoroughly degreased upon removal. A rust inhibitive thin protective film remains on the work for about 20 min. before complete evaporation.

This material is considered to be non-flammable and non-explosive. It can serve as an alternate for vapor degreasing, aqueous alkaline degreasers, benzines and similar types of cleaners for use in plating, painting, Parkerizing, anodizing or other finishing. Open wood or steel tanks can be used as containers as well as standard degreasing machines. Redistillation yields not less than 90 percent recovery at 375 to 410 F.

Twitchell Greaseproof Wrapping Meets Government Requirements

To meet government specifications calling for greaseproof wrapping of metal parts the Packaging Div., E. W. Twitchell, Inc., Public Ledger Bldg., Philadelphia, Pa., has developed Ordnance Greaseproof, an anti-corrosive paper. Common base weights are 25 and 40 lb., but the paper can be supplied in any desired weight, either plain or waxed. For uses requiring greater strengths or where a waxy surface may not be desirable, it is available in 25 lb. weight laminated to 30 lb. neutral Kraft paper.

American Zinc Coated Steel Resists Rust and Corrosion

An electro-plated zinc steel has been placed on the market by American Nickeloid Co., Peru, Ill., as a substitute for pure nickel, tin, chromium, aluminum or stainless. The zinc provides a protective coating to the steel base metal, making the sheet resistant to corrosion and rust. This steel can be bent, formed, drawn, stamped, soldered and spot welded to meet most production requirements. The coating is claimed not to crack or flake.

Sheets in sizes up to 36×96 in. in a full range of gage tempers, in polished, unpolished and satin finishes are available. The thickness of the coating can be varied to meet individual application.

Tempilaq Welding Compound Produced in Liquid Form

A liquid form of temperature signaling compound known as Tempilaq, for use in welding, heat-treating, fabrication of metals, or in any other operation involving the controlled application of heat, has been introduced by Tempil Corp., 132 West 22 St., New York, N. Y. It is available in a wide range of predetermined melting points between 125 and 1600 F.

A thin smear or daub applied to the working surface dries instantly. When the temperature indicated on the bottle is reached, the smear liquifies sharply. On cooling it solidifies, leaving a glossy or vitreous mark distinctively different from the original smear. This compound is equally suitable on glass, wood, ceramics or plastics as well as on metal. It is put up in 1½ oz. bottles, with over 300 determinations.

TRADE PUBLICATIONS

ALLOY STEEL A compact chart showing analyses, physical characteristics and applications of 19 different stainless steels, monel and nickel alloys is offered by The Cooper Alloy Foundry Co., 210 Bloy St., Hillside, N. J.

BELT DRIVES Written and illustrated in a simple, easy-to-understand manner, "23 Ways to Conserve the Life of Your Multiple V-Belt Drives," prepared by the Engineering Research Bureau of the Multiple V-Belt Drive Association, 140 S. Dearborn St., Chicago, Ill., is designed to educate power users in the proper procedure of selection, installation and maintenance of multiple V-belt drives.

BELT SURFACING A 24-page booklet entitled "Wet-Dry Belt Surfacing," issued by the Porter-Cable Machine Co., Syracuse, N. Y., points out the departments in which belt surfacing saves time, money and manpower.

BLOW TORCHES Lighting instructions and safety hints are pictured on the attractive, two-color wall chart entitled "Know Your Blow Torch" which is offered to industries and schools by the Turner Brass Works, Sycamore, Ill.

BRAZING ALLOY Specifications and uses of Phos-Copper are contained in a folder issued by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

BRUSHES A new edition of Bulletin Br-103 on brushes, with a section on Staplbond Tampico brushes and steel wire brushes embodying a newly developed type of construction, has been issued by the Hanson-Van Winkle-Munning Co., Matawan, N. J.

Steel-Service Plants Vital to War Effort

Wartime manufacturers by the thousands are relying on their nearby Steel-Service warehouses to supply small quantities of urgently needed steels. Emergency repairs; bottle-necks in mill deliveries; threatened production line shortages; steel for experimental and model machinery —these problems are all a part of the day's work for a Steel-Service Plant. These firms, among whom Joseph T. Ryerson & Son, Inc., in particular, has shown exceptional ingenuity in solving wartime problems.

(See Advertisement)

Answering inquiries and handling customer problems at Ryerson.

True: Steel is Short-
But Ryerson Often Solves the Problem

IN America's vast production effort, there is some man in every company who is responsible for *getting* steel—a man who must get things *done.* In some plants he's called an "expeditor". But whether he is purchasing agent, expeditor, or plant manager, he *must get results.*

Ryerson Steel-Service is built to order for his needs! When steel problems become a stone wall, Ryerson usually can come thru with some practical solution. A suitable alternate for steel that's vitally needed, but isn't in stock; a suggestion for heat-treating, machining, welding, or some other way to adapt the steel at hand; rush handling and delivery that will lay the steel down where it's needed, *when* it's needed!

While this is all in the day's work for Ryerson Steel-Service men—you must keep in mind that we are entirely out of many kinds and sizes and that all must be sold in strict accordance with the WPB program.

This help in getting things done is available to your organization. Ryerson Steel-Service men are easy to reach; they'll give you prompt consideration.

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Detroit, Cincinnati, Cleveland, Buffalo, Boston, Philadelphia, Jersey City

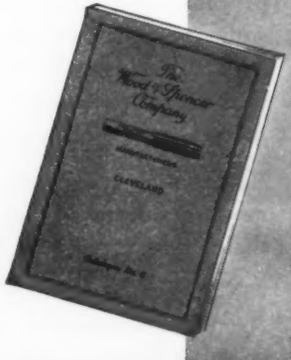
RYERSON STEEL-SERVICE

Woody Spencer says...

"PICK THE RIGHT TOOL"

You'll do *more work, better quality work,* in *less time,* if you select the proper tool for the job at hand . . . and, after PICKING THE RIGHT TOOL, YOU KEEP IT IN CONDITION and USE IT CAREFULLY AND INTELLIGENTLY. Then, feel secure that you're doing your part in helping produce to whip the Axis.

Let us help you select the right tap for your job?



FROM CUSTOMERS BLUEPRINTS WE QUITE FREQUENTLY MAKE RECOMMENDATIONS FOR

"THE RIGHT TAP AT THE RIGHT TIME"

The Wood & Spencer Company
Cleveland, Ohio

CARBIDE TOOLS Comprising over 30 pages, a general tool catalog designed to facilitate ordering has been made available by Carboloy Co., Detroit, Mich.

CONTROLS An 8-page booklet containing a complete description of Bulletin 836 pressure and temperature controls and showing suggested methods of application has been published by Allen-Bradley Co., 1311 S. First St., Milwaukee, Wis.

CONVEYORS The 16-page catalog offered by Lamson Corp., Syracuse, N. Y., illustrates and describes roller gravity conveyors and includes a table on selecting conveyors for various package sizes.

DISCHARGE COUNTER The General Electric Co., Schenectady, N. Y., offers Bulletin GEA-3864 illustrating and describing the discharge counter, a device to record the number of times a lightning arrester functions.

DISTRIBUTION The design, operation and characteristics of the various types of industrial distribution systems are described in the 24-page booklet B-3152 announced by the Westinghouse Electric & Mfg. Co., Dept. 7-N-20, East Pittsburgh, Pa.

FACE-MILLING Details of "Hyper-Milling," a new method for the face-milling of steel, are given in Engineering Bulletin No. FE-106 published by Firth-Sterling Steel Co., McKeesport, Pa.

GRINDERS Bulletin H1V-3 of The Hill Acme Co., 6400 Breakwater Ave., N.W., Cleveland, Ohio, contains information on vertical spindle and horizontal spindle open side hydraulic surface grinders.

HEAT TREATMENT "Improved Processing," a booklet prepared by The Selas Co., Philadelphia, Pa., interprets new selective heat treating methods using gas-air fuel supplies.

HOB SHARPENING "Right and Wrong of Hob Sharpening," a 27-page booklet containing sketches showing sharpening problems and errors and giving solutions, is one of the booklets in the technical data series issued by the Illinois Tool Works, 2501 N. Keeler Ave., Chicago, Ill.

KNURL-SELECTOR Reed Small Tool Works, Dept. AM, Worester, Mass., has developed a slide rule type selector table to simplify selection and ordering of knurls according to size, pitch, and pattern and catalog number.

MAGAZINE The Detroit Rex Products Co., Detroit, Mich., manufacturers of Detrex degreasers, alkali washers and chemical cleaning compounds, announces the publication of "Detrex News," a monthly company newspaper.

MILLING MACHINE A 12-page catalog, M-964-1, covers the No. 0-8 plain automatic milling machine of the Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio.

MOTOR Leaflet GEA-3922, prepared by General Electric Co., Schenectady, N. Y., supplies detailed information on the totally inclosed induction motor for use in magnesium dust, aluminum dust and other combustible metal dusts.

PLANERS A drawing of Type MD medium duty planer, construction features, dimensions and specifications are included in Bulletin 154 of Liberty Planers, Inc., Hamilton, Ohio.

PRESSES Bulletin 4206 "Fastraverse Metal Working Presses" and Bulletin 4207 "Presses for Process Industries" are offered by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

RECORDERS In Bulletin A-321 The Foxboro Co., Foxboro, Mass., presents its operation-time recorders, both electric-operated and mechanical, and explains the application of such instruments to the processes of various industries.

SLOTTER Uses of the Universal Slotmaster are illustrated and described in a 4-page folder prepared by the Experimental Tool & Die Co., 12605 Greiner Ave., Detroit, Mich.

SPRINGS "Better Brush Springs" is the title of Bulletin No. 5 issued by Instrument Specialties Co., Inc., Little Falls, N. J. Part 1 of this bulletin describes 1-S micro-processed beryllium copper brush springs and Part 2 gives brush spring design data.

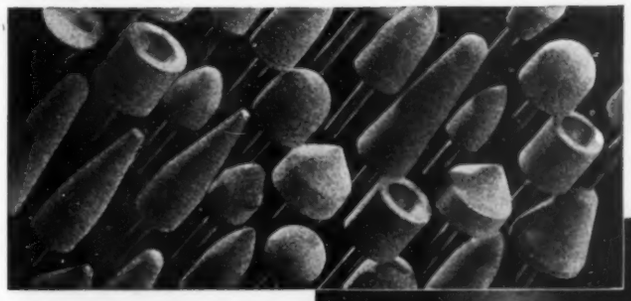
TAPS "Tap Talk" is the title of the first booklet of a series on taps to be introduced by Greenfield Tap and Die Corp., Greenfield, Mass.

THERMOCOUPLES A 6-page bulletin, interpreting the recently amended WPB conservation Order L-134 as it applies to use of thermocouples and thermocouple protecting tubes for pyrometric instruments, has been issued by Wheelco Instrument Co., Harrison and Peoria Sts., Chicago, Ill.

WELDERS Photographs, diagrams and descriptions of radial portable welders are contained in the 19-page booklet issued by Sciaky Bros., 4915 W. 67 St., Chicago, Ill.

WELDERS The Progressive Welder Co., 3050 E. Outer Drive, Detroit, Mich., has issued a series of bulletins. The Temp-A-Trol forge welder is illustrated and described in Bulletin No. 301, the aircraft steel welder in No. 401 and aluminum welding equipment in No. 101.

CALLED FOR ACTIVE DUTY ON THE PRODUCTION FRONT



ATTENTION!

We have a new job—to keep grinders going full blast all over the country in every war industry — in machine shops, tool rooms, experimental laboratories, repair departments, arsenals.

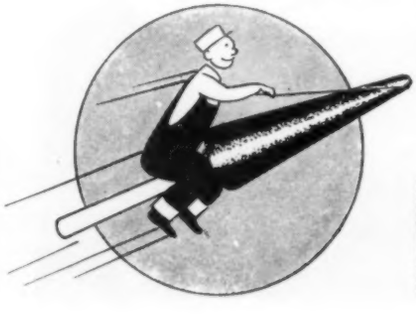
Our complete facilities are now devoted to making CHICAGO Mounted Wheels and Vitrified Grinding Wheels 3" and under in diameter. We're proud and happy to be given this definite and important part in the War Program. Our work goes on night and day supplying these vital aids for Victory.

Send us your priority orders for mounted and unmounted grinding wheels up to and including 3" in diameter. You will get the right wheel for the job—when you want it.

We no longer manufacture the larger grinding wheels. We're sorry to have to disappoint our good customers (many of whom have been with us for half a century) on their orders for Vitrified Wheels over 3" in diameter.

Specializing on high production of Mounted Wheels, Cut-off Wheels and small Vitrified Grinding Wheels will be our job until the war is won. We know you will understand.

YOU SHOULD HAVE OUR NEW CATALOG. It shows in actual colors and exact sizes the most complete line of Mounted Wheels made. Send for copy today.



CHICAGO WHEEL & MFG. CO.

America's Headquarters for Mounted Wheels. Established 1896.

1101 W. Monroe St., Dept. AT, Chicago, Ill.

AT-12

Please send new Chicago Mounted Wheel Catalog

Name .....

Address .....

Stuart Oil Products
Commandos of Industry!
Stuart's
Thred Kut
HEAVY DUTY CUTTING OIL
Recommended by America's leading machine tool builders.
Stuart's
CODOL
LIQUID GRINDING COMPOUND
Meets every test for the ideal Modern Grinding Compound
Stuart's
SOLVOL
LIQUID CUTTING COMPOUND
For carbide tools and where an "oquamix" solution is recommended
Stuart's
"SUPER-KOOL"
AMERICA'S FIRST TRANSPARENT SULPHURIZED CUTTING AND DRAWING OIL
STUART OILS have led the attack on tough metal working problems for many years. Take advantage of the experience behind them and, without allowing superficialities to interfere, study your cutting fluid applications with the help of Stuart Oil Engineering Service.
Stuart Oil
Engineering
Goes with every Barrel
For All Cutting Fluid Problems
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865

NEW BOOKS

MECHANICAL DRAWING—*By Ervin Kenison, professor emeritus, Massachusetts Institute of Technology, and James McKinney, educational director, American School. Revised by Tom C. Plumridge, head of drafting and design department, American School.* 330 *pages. Published by the American Technical Society, Drexel Ave. at* 58 *St., Chicago, Ill.* $2.

Illustrated with 402 line drawings, this "how-to-do-it" book has been developed for the use of extension students. It is especially helpful for the person wanting to study at home, and also is suitable for use in high school, vocational school, trade school and evening school classrooms. The text is divided into 14 sections, each of which includes a discussion of the principles involved and a number of exercises to provide practice for the students.

•

SURFACE FINISH—*By Dr. George Schlesinger, director of the research department, The Institution of Production Engineers, London, England.* 231 *pages. Published by The Institution of Production Engineers,* 39, *Portman Sq., London, W.*1, *England, and distributed in the United States by the American Society of Mechanical Engineers,* 29 *West* 39 *St., New York, N. Y.* $3.25.

Although reliable reference values have been scientifically established and standardized for chemical analysis, physical tests and dimensional measuring, no values have been generally accepted for surface roughness. Consequently, the research department of the Institution of Production Engineers has compiled in this book new and hitherto unpublished information on surface finish as a guide for establishing standards on this subject.

The most important work covered in the research program was to find out the limits of surface roughness which are used today by the British metal machining industry, using existing and practically tested surfacemeters. Also included in the book are data on the proposed American Standards for surface finish, as well as details of the use of Abbott and Brush instruments used in America to measure surface irregularities. The comparison of various measuring methods for determining surface finish and the results obtained with various types of surfacemeters are covered in considerable detail with specific figures given in tabular form.

All the instruments used in the research for these published data are discussed according to (1) principle of the design, (2) unit of measurement, (3) range, (4) accuracy and scope, and

(5) calibration. Practical work shop instruments were used in the research work. Some of these were tracer instruments, which by means of a sharply pointed stylus, the average height and/or the shape of the undulations of the surface were measured. Others were optical instruments by means of which the kind of machining, and degree of roughness of the surface could be compared with that of a master surface. Additional work was done with photoelectric instruments in which the brightness of the light scattered from the surface provides a number that is generally representative of the roughness.

SEEN and HEARD

By JOHN R. GODFREY

New Die Classifications

Some of the plane building plants in which punch press work plays a big part have developed special die classifications for different kinds of work. The first class is the regular die-set or subpress die which is used where the quantity warrants tying up a die-set on one job.

The second class uses a die-set but uses it to hold punches and dies which are set up in the die-set for each particular job. These are used because it is much easier to align the punch and die in the die-set than in the punch press itself and also because it leaves the press free for production until the new job is ready to run.

The third class has been developed for use in short runs where die cost must be kept at the lowest possible figure. Here the punch is made of any plate steel that will harden satisfactorily; plow steel is a favorite in the plane plants on the west coast. These punches are shaped and ground with a good clearance angle. The die, of Kirksite or other soft metal, is shaved by the punch after it is hardened. When the die wears it is peened around the edges and shaved again with the punch. In this way inexpensive dies can be made to turn out a fairly large number of punchings at minimum production cost.

Utilizing Scrap Material

One ingenious shop manager on the West Coast has found a source of good material for fixtures to be used in connection with his work in making parts for airplane landing gear. He picks out scrap plates from a shipyard not far away and utilizes these for building his fixtures.

A cutting torch outlines the shapes he needs for the different fixtures. Then the welder gets busy and soon these pieces of scrap are built up in shapes that he needs for the work to be done. All that remains is to drill, bore and bush the walls or sides

Fast, dependable "factory transportation" on Standard Conveyors is vital to the swift movement of finished goods to shipping platforms—to railroad cars—to the holds of ships destined for America's far-flung battle fronts.

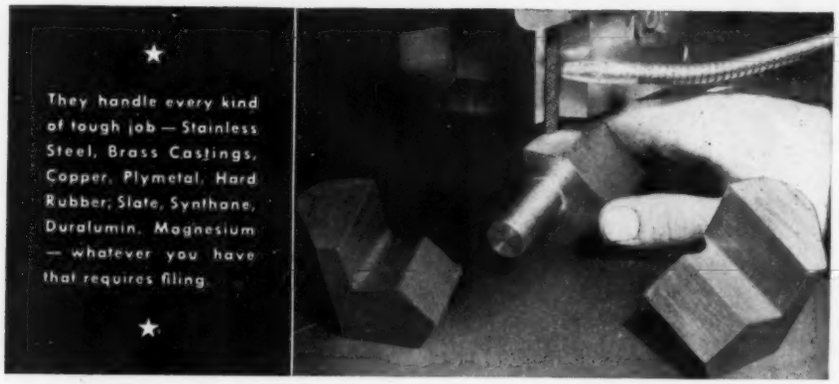
For the most efficient methods and equipment for handling on conveyors —power or gravity—industry looks to Standard—its engineering experience —its unusually wide range of equipment for handling all types of commodities except bulk. Send for the 84-page "Standard" booklet, Bulletin No. AM12—a useful, valuable reference book on conveying and conveying methods for production executives.

Standard Conveyors as installed in prominent West-Coast Aircraft plant.

STANDARD CONVEYOR COMPANY
General Offices: **NORTH ST. PAUL, MINN.**
Sales and Service in All Principal Cities

★ ENGINEERED FOR FASTER PRODUCTION ★

File Continuously with DoAll BAND FILES


They handle every kind of tough job — Stainless Steel, Brass Castings, Copper, Plymetal, Hard Rubber, Slate, Synthane, Duralumin, Magnesium — whatever you have that requires filing.

DESIGNED FOR TODAY'S TEMPO

DoAll Band Files give you CONTINUOUS Cutting, so are far ahead in stamina and smooth performance. And, as for speed—well, they're eight times as fast as hand filing, five times as fast as jig filing.

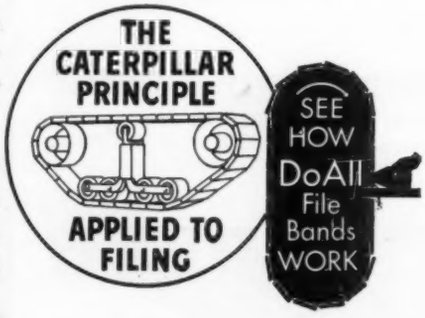
So—stop fiddling around with slow, old-time methods. Put DoAlls to work in your plant and get your jobs done!

Remember this—there's no back stroking and no stopping, just steady, even, one-way travel.

23 DIFFERENT SIZES

You will find a width, cut and style DoAll Band File to handle just about everything. Each one is precision built to give long satisfactory service.

Send today for interesting book on DoAll Band Filing.



THE DOALL COMPANY

1210 Thacker St. DesPlaines, Ill.

Associated with Continental Machines, Inc. Minneapolis, Minn.

of the fixture, and he has a drilling fixture.

Fixtures for milling and for faceplate work are made in the same way. His source of supply seems to be unlimited, and it's a lot more economical to use this scrap in this way than to send it back for remelting and rerolling.

Shop Transport

The larger the shop the greater the problem of shop transport, both for material and for the personnel.

Small motor scooters and miniature autos are becoming common sights in many large plants. Bicycles are being adapted by the addition of a third wheel and boxes or trays between two of them. While regular package-carrying tricycles are on the market and are used considerably in some government office buildings, some large plants are improvising similar vehicles, utilizing bicycles as a base.

It may be possible to adapt the moving platform type of conveyor to move both workers and products.

What's Wrong With Production?

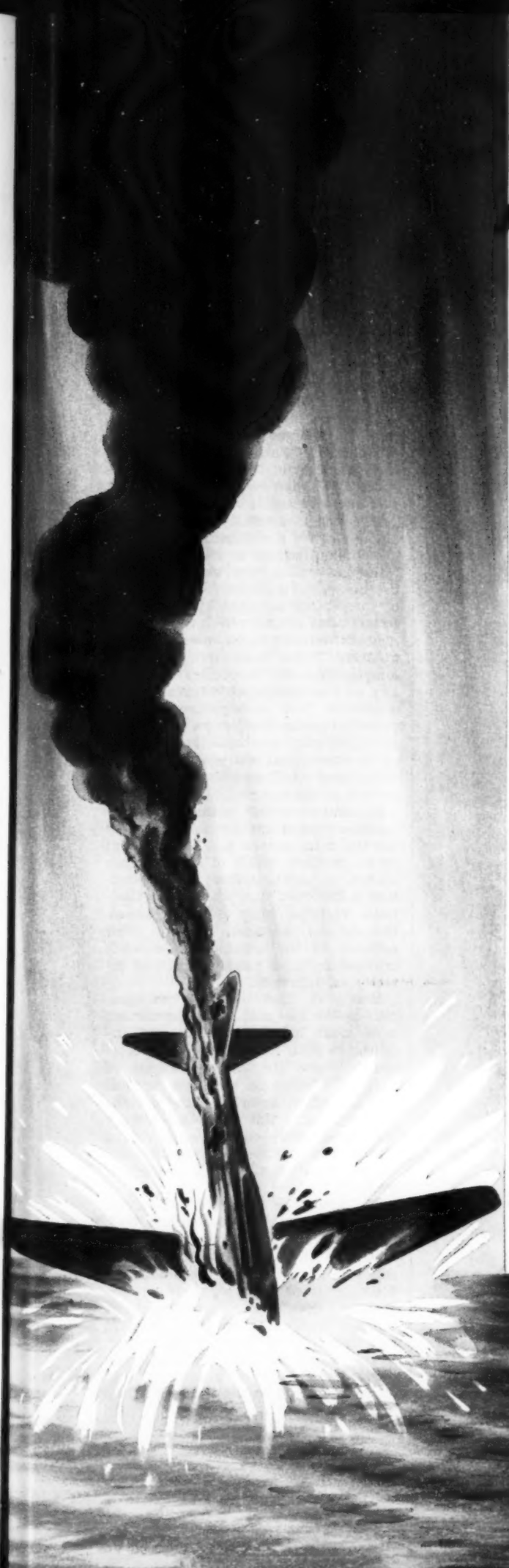
BY FRED H. COLVIN

Production may be hampered by inspection that frequently has no direct bearing on the proper functioning of the product. Unwarranted specifications cause delays, especially when inspectors lack practical knowledge to interpret them. Add to this the mistaken idea of too many inspectors that their value depends on the amount of work they reject and production is hampered from start to finish.

One of the failures is caused by the inability to break away from past experience. This is particularly true where the previous experience has been in large, mass production plants where special, single-purpose tools predominate. Men accustomed to these conditions do not readily adapt themselves to the use of other methods which become necessary when certain machines are not available.

One weakness of many production men is a tendency toward over-mechanization. They design elaborate machines that combine far too many operations. This increased initial cost or initial machine overhead, adds materially to the real total cost of the product. These expenses are often forgotten in the effort to reduce direct labor cost to its lowest possible terms. When total costs that include interest on investment, "down time" and maintenance are considered, the saving in direct labor cost frequently becomes insignificant. There are many cases where complicated machines have proved less efficient than those of simpler design.

With the lack of skilled or semi-skilled labor at present, it is all the



Making the Enemy DIE

FOR HIS COUNTRY

VICKERS

HYDROMOTIVE CONTROLS

Soldiers of the U. S. Army are now given this maxim: "It is commonly supposed that the primary duty of a soldier is to die for his country. This is not true. It is his duty to make the enemy die for his."

The spirit of aggressiveness which this reveals should be heartening to every American, and all Americans will want to do everything they can to make the enemy "die for his country" in this war of survival.

Vickers Incorporated is contributing to this effort on many fronts. Vickers Hydromotive Controls on our war machines have helped compel many an enemy into this sort of heroism. These high pressure oil hydraulic controls are dependable, accurate, easy to operate, easily adjusted, insensitive to vibration and shock . . . reliable no matter how tough the going.

VICKERS *Incorporated*

1410 OAKMAN BLVD., DETROIT, MICHIGAN

Engineers and Builders of Oil Hydraulic Equipment Since 1921

Each new star added to "Old Glory" was a symbol of vast accomplishment and new and greater responsibilities. How well our American forefathers met their challenge is a story held in world-wide respect. . . . Today, a star added to the distinguished joint award—the Army-Navy "E"—signifies continuous production accomplishment and new incentive in the traditional American way. . . . We proudly add our first star . . . fully aware of our increased responsibility as full partners with our fighting men.

WYCKOFF DRAWN STEEL COMPANY

FIRST NATIONAL BANK BLDG.
PITTSBURGH, PA.
3200 SO. KEDZIE AVENUE
CHICAGO, ILL.

Manufacturers of Carbon and Alloy Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12"x 2"

more essential that machine operations should be simple. Some of our best examples of efficient output have come from shops which utilized such machine equipment as could be found without waiting for new special machines to be built.

Production is also seriously handicapped by one factor over which it has little control—a wage ceiling which exists in many plants. In more than one large plant engaged on vital war production, men are holding back after they have earned all the plant wage ceiling permits, per day or per week. Machine and man-hours are lost because a rate setter guessed wrong on the maximum output obtainable.

Many shops find some way to cut piece rates when men earn more than the wage ceiling set by management, in spite of the fact that the more work produced by man and machine, the lower the cost of the parts made. Machine and other overhead costs go on with the increase in output per hour.

Of course every man should turn out all he can for the fighting forces. But it is human nature to resent a cut in rate just because you work harder or become more proficient. The attitude of infallibility assumed by many rate setters adds to this resentment.

Production can be increased by guaranteeing piece rates for reasonably long periods. Nor must they be cut by any of the many subterfuges usually employed. They must either have an iron-clad guarantee or an agreement by which rates can be adjusted either up or down when both sides agree that adjustment is necessary to secure maximum production.

In addition to the handicaps already mentioned, still another is imposed by the top management and by society at large. Neither heads of industry nor leaders of society realize that production is the most vital part of any business. The real value of the president, the general manager, or any other member of the organization depends on how much he helps production, directly or indirectly.

Educators and business managers fail to realize that good production men must have more skill and intelligence than for many of the professions. There are many examples of shop men becoming excellent business administrators, as in the case of General Knudsen. But there are mighty few cases where college men with a liberal arts or business administration degree know much about production problems.

We need more and better production men. They must be recognized both financially and socially as a vital part of our organization. Parents must be educated to realize that the production department of any plant is of the greatest importance. They should encourage their sons to be production men rather than join the office staff. Brains which can design intricate machines that increase production and lower costs are more valuable than those only able to keep tabs on time cards.

Chrome Plating Saves Tool Steel

Hard chrome plating, while not new to the machine tool industry, has not been used nearly to the extent of its fullest possibilities. For example, in the case of new tools and punches, the operating life of the cutting edges can be increased and the number of re-grinds decreased, resulting in longer runs between grinds, decrease in set-up time, and greater work accuracy.

An interesting example of hard chrome plating is its use on a tool used for making a valve for an ordnance product. This was a bottleneck job which ran three shifts around the clock, and it was necessary to grind the tool once or twice each shift—the average being four or five grinds daily. Much valuable tool steel was ground away each time the tool was sharpened to remove deep scores in the groove.

After this tool had been hard chrome plated it remained in operation for seven full days. It was then removed, ground and replated. The second, third and fourth runs equalled, and in two cases, bettered the first performance of that tool. It has been estimated that this procedure will save approximately 450 lb. of tool steel annually, as well as saving money on tool grinding. The greatest benefit accrues from the fact that the tool remains in constant production.

Hard chrome plating can be used successfully for reclaiming worn tools. Prior to the application of plating, one plant scrapped certain tools when worn to prescribed limits. They are now reclaimed and reused by plating them to their required thickness, thereby giving many additional hours of service.

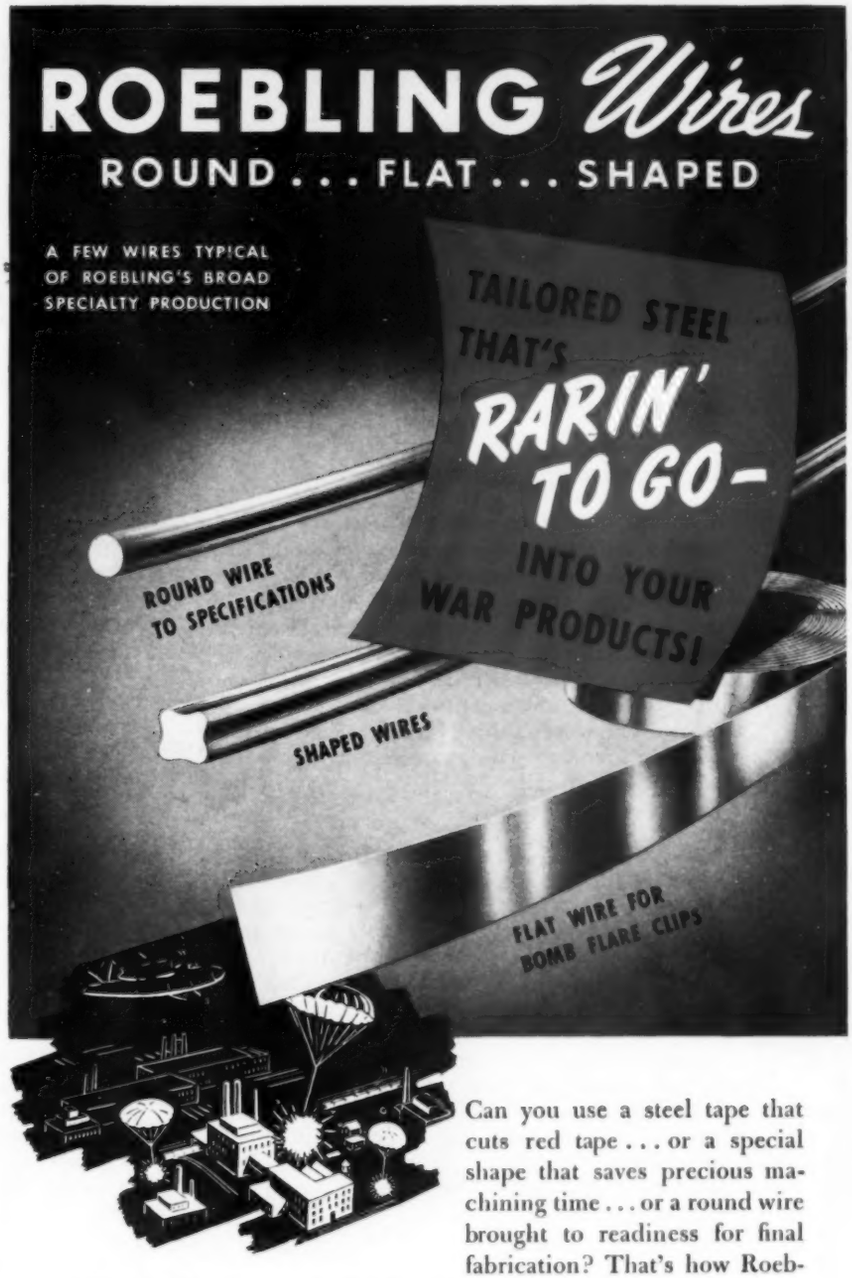
Tension Factor Influences Length of Life of V-Belts

Conclusive evidence that the life of transmission belting and V-belts is greatly influenced by tension, and that an increase in the tension over that recommended for the belt operation will result in failure of the belt long before it should break down, is furnished by data from a series of tests conducted under the supervision of G. H. Stewart, belting engineer, B. F. Goodrich Company.

Three grades of the present wartime construction of transmission belting were used in the tests, and run at 15 lb. per in. per ply, a 720-lb. total for the tension, the recommended figure, and at 18 lb. per in. per ply, a total of 864 lb. tension, on 4 in. pulleys.

One grade of belt ran 95 hours before breakdown while under the 18-lb. tension, but ran 230 hours before failure when the 15-lb. tension was used; another grade ran for 88 hours and 263 hours, respectively, under the two tensions; the third grade ran for 15 hours and 48 hours respectively, under the two tensions.

Each of the tests was accelerated and results are intended merely to indicate the ratio of tension to belt life.


ROEBLING Wires
ROUND . . . FLAT . . . SHAPED
A FEW WIRES TYPICAL OF ROEBLING'S BROAD SPECIALTY PRODUCTION
TAILORED STEEL THAT'S RARIN' TO GO— INTO YOUR WAR PRODUCTS!
ROUND WIRE TO SPECIFICATIONS
SHAPED WIRES
FLAT WIRE FOR BOMB FLARE CLIPS

Can you use a steel tape that cuts red tape . . . or a special shape that saves precious machining time . . . or a round wire brought to readiness for final fabrication? That's how Roebling can help you . . . by supplying the right wires, made to exacting specifications of steel analysis, dimensions and finish . . . and getting them to you on schedule!

Roebling Flat Wire for Bomb Flare Clips is typical of countless minor masterpieces of wire-making that are rolling out of the Roebling mills today. And they get to the battlefront faster because they require a minimum of handling and finishing on the production front . . . minimize scrap and reject losses in the bargain.

If specialty wires can do a job for you, call on Roebling's long experience in meeting specifications that require close adherence to physical and chemical requirements. With special facilities to handle this type of work and the trained personnel to give it the close attention to detail it demands . . . we're ready and able to go to work on your problem. Prompt action on war orders.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY · Branches and Warehouses in Principal Cities

AD-NALYSIS

One of a Series Showing How Industrial Advertisers Are Using Informative Messages in American Machinist to Help Management and Production Executives of Metal-Working Plants War

No. 3

Steel Companies Mobilize Scrap

A number of leading metal producers are currently devoting their advertising pages to stimulating scrap collection drives. Typical is a spread in which a big steel company appeals to Metal-Working plants to save and turn in scrap. Stressing the urgent need, the copy specifically suggests checking "bread-and-butter" scrap (chips, filings, etc.), dormant scrap and "rainy-day" scrap (old equipment being saved for some indefinite emergency). Also given are suggested steps toward organizing "your own scrap drive". A truly helpful, timely theme.

Furnaces Turn on the Heat

A 2-color page thoroughly covering the advantages of a furnace, first of its kind, employing 100% forced convection heating in the hardening, normalizing and annealing range. The company, a regular *American Machinist* advertiser, tells how the unit will give increased production, minimize distortion, reduce handling and require less floor space. Each of these points is elaborated on, with the help of small, simplified drawings. A very good example of how to sell the basic merits of a product in terms of today's and tomorrow's metal-working requirements.

Automatics Boost Production, Cut Costs

The single spindle automatics featured in this latest of a series of ads offer very definite advantages to manufacturers. As described through a "case history" study, it is possible to make in relatively *small quantities* (5,000 to 10,000 pieces) duplicate parts formerly turned out by methods requiring more machines and more operators. Installation of these automatics will release other critical machine tools and labor for other purposes . . . and naturally increase this company's penetration of the market. Ad shows the parts mentioned, machine turning them out and several additional installations in other plants.

Building Accuracy Into Small Tools

The name and products of this company have been known and respected for years, wherever the wheels of industry turn. Yet the firm recognizes the wisdom, the necessity, of keeping everlastingly at the job of advertising the quality of their tools. Latest example is a 2-page, 2-color insert giving the step-by-step procedure through which a taper reamer is made, showing how extreme accuracy is achieved. Ad is in picture-and-caption form, and was condensed from the company's own house publication. (Ad Mgrs. note this fertile source of informative copy).

Calling All Horsepower

That's the title of a free booklet offered by a leading manufacturer of electrical equipment. The booklet gives the details of this story: Electric motors are built with extra reserves of power for emergencies. The company suggests, therefore, that in this greatest emergency of all time, motor users modify their peacetime practice of having "overmotored" applications, and instead get every bit of horsepower out of every motor they have. (Manufacturers of other types of products might similarly urge "all out" usage in these critical times.) The ad pictures the product; includes a table for stepping up ratings and thus saving materials that would be needed for additional motors; finishes off with the statement "Standard Motors Generally Available for Prompt Delivery for War Jobs".

Proper Handling Protects Broaches

Headlined "How to get more production with your Broaches", this black-and-white page goes into detail on Point No. 1 . . . proper handling. Individual storage racks, care in not dropping the broaches and protection against corrosion when stored are among the suggestions given. Photo shows "the quickest way to spoil good broaches—lean them against each other in a corner". Ad is certainly helpful to users, and will help assure good performance (and maintain the reputation) of the company's products.

Memo from AMERICAN MACHINIST

is "READERSHIP" in your dictionary ?

Recently one of the gals in our office was sent out to buy a dictionary. Instead of coming back with a modest tuck-in-the-drawer item, she proudly purchased a 3-inch-thick Webster's Collegiate, which doesn't sell for hay. We kept it, feeling extravagant but very much of an authority on words.

So the other day, one of our *American Machinist* editors said, "Hey—you guys are always talking about 'readership.' There ain't no such word." We retorted, "Oh, yeah?" and grabbed up the above mentioned Webster's Collegiate.

Frankly, the word wasn't there. Rather than give in to an editor, we dashed for one of those hoary, mammoth Webster's that takes a stand to hold it up. In the odds-and-ends section, bottom of page 1777, we found "readership, *n.* . . . see -ship". And "-ship" says "A noun-forming suffix added chiefly to nouns denoting persons, but sometimes to adjectives and even verbs".

Readership, we decided after long and learned discussion, is part of the advertising man's lingo and has been kicked around no end. It can have a bearing on anything from "circulation" to "quality of readers" . . . depending on who is pounding the typewriter and what he's trying to prove.

Your dictionary may or may not include a definition of "readership", but whatever the word, and in whatever sense it's used, *American Machinist* has it. Over 22,000 net paid subscribers, who pass their copies around until more than 100,000 production men go through each issue, depend on *American Machinist* for practical know-how.

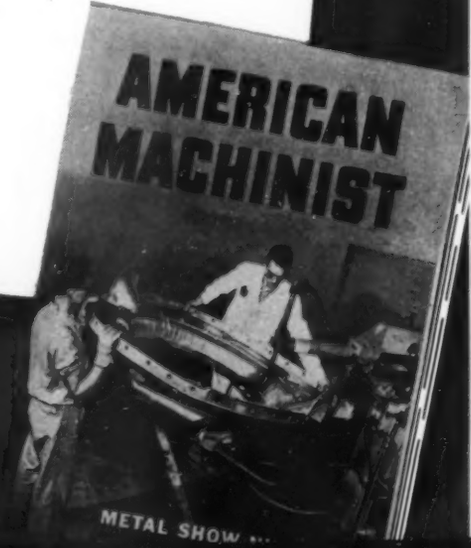
These men, naturally, are busiest right now making war goods and the machinery to produce same. Metal-Working executives were never more active, and never more vocal in their appreciation of the armament production data *American Machinist* gives them fortnightly. (This is the type of editorial service which recently won first award for Class I "Best Series of Articles" in *Industrial Marketing's* Annual Competition for Editorial Achievement. *American Machinist* thus became the first and only 3-time winner of this event.)

Very close attention is likewise given the advertising pages of *American Machinist*. And your ads will really click if they contain messages of tangible help in solving day-in, day-out production problems.

American Machinist is important to important people. Use it wisely, use it often, to tell your wartime story to Metal-Working.

★ ★ ★

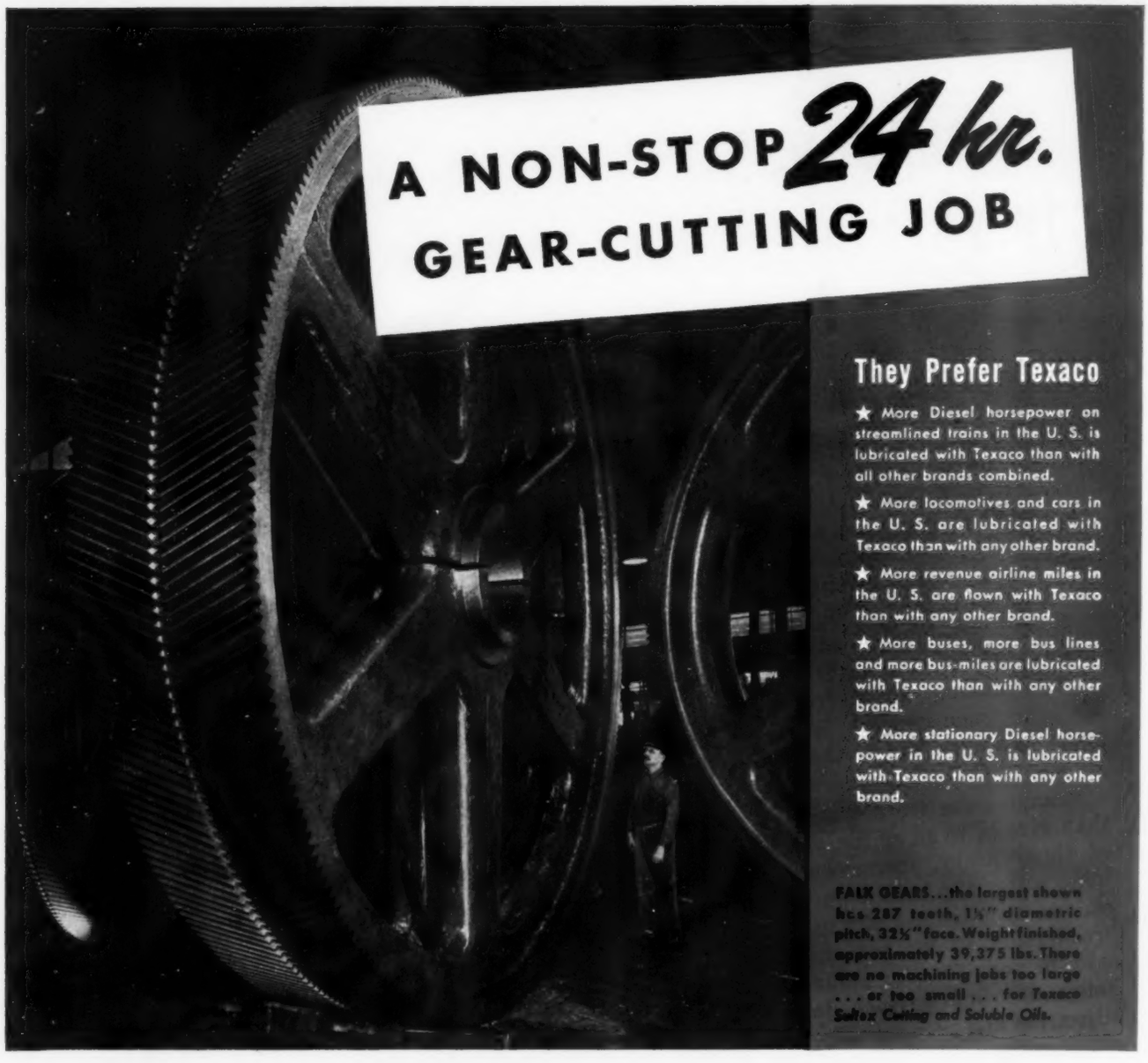
CIRCULATION now over 22,000 net paid . . . **READERS** over 100,000 fortnightly . . . **ADVERTISING** page gain for first half of '42 greater than that of any other publication of any type.



AMERICAN MACHINIST

A McGraw-Hill Publication ABC • ABP 330 W. 42nd St., New York

TOPS IN METAL-WORKING FOR 65 YEARS


A NON-STOP 24 hr.
GEAR-CUTTING JOB
They Prefer Texaco
★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.
★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.
★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.
★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.
★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.
FALK GEARS...the largest shown has 287 teeth, 1½" diametric pitch, 32½" face. Weight finished, approximately 39,375 lbs. There are no machining jobs too large . . . or too small . . . for Texaco Sultex Cutting and Soluble Oils.

LONG HOB-LIFE is a "must" on work like this. To avoid backlash, once started, the hobber must not stop!

Big cast steel gears like these require 24 hours or more to complete and hobs *must* stay sharp.

Texaco Sultex Cutting Oils keep them sharp and are preferred everywhere for difficult machining jobs.

Texaco Cutting Oil lubricates the hob and keeps down the heat, preventing chip welding and assuring better surface finish.

Increase output per tool grind, reduce idle machine time, save hard-to-replace cutters by using Texaco.

The outstanding performance that has made Texaco preferred in the fields listed in the panel has made it preferred by prominent users in the metal-cutting field.

Texaco users enjoy many benefits that can also be yours. A Texaco Engineer specializing in cutting coolants will gladly cooperate . . . just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write The Texas Company, 135 East 42nd Street, New York, N. Y.

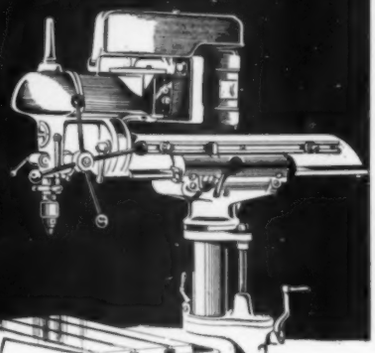
TEXACO
REG. T.M.

TEXACO Cutting and Soluble Oils
FOR THE METAL-WORKING INDUSTRY

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

COVER MORE GROUND with

walker-Turner Radial Drill



You can cover an astonishing lot of ground in area, work handled and output — with a WALKER-TURNER RADIAL DRILL. Handles all light drilling, tapping and routing at any point within a 62" circle. Spindle speeds from 160 to 8200 r.p.m. Distinct advantages are; 1—Prompt shipment to war industries. 2—Compactness permits installation at any point in production line. 3—Women operators find them easy to operate and unskilled labor can learn to handle them with very little breaking-in. 4—Standardizatiton and quantity production permit an exceptionally reasonable price for a machine tool of high quality of design and materials. Send for literature.

WALKER-TURNER COMPANY, INC.
4440 Berckman Street,
Plainfield, N. J.

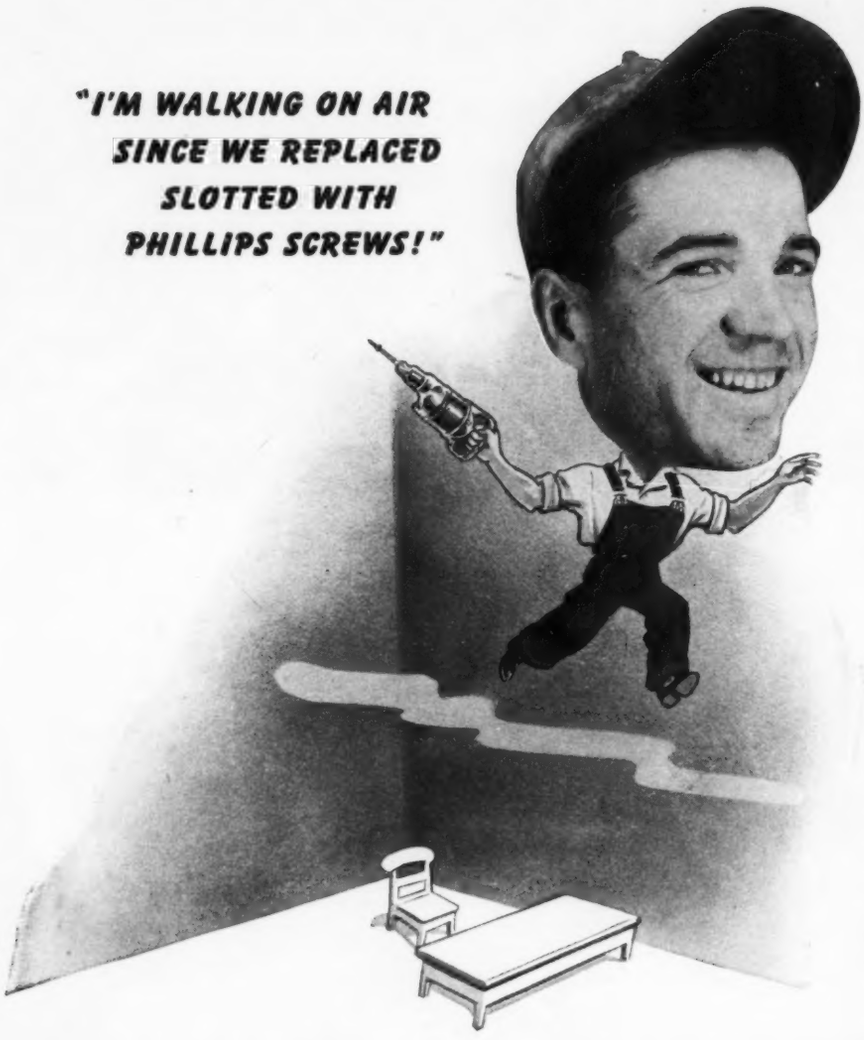
Small diameter holes (up to ½"), a large area to be covered and a heavy, cumbersome jig makes an ideal set-up for a WALKER-TURNER RADIAL DRILL.

(Photo courtesy Lewyt Metal Products)

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS



Easier Work • Less Fatigue • No Production Slumps = 50% Less Assembly Time with Phillips Screws

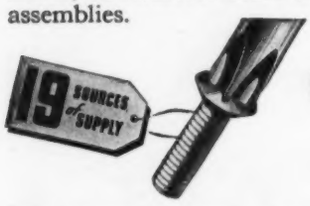
Take a man who is being asked to put his "all-out" effort into assembly work.

You have been giving him slotted screws. Did *you* ever try to *speed up* using slotted screws? It's just inviting trouble, that's all; if you aren't slow and cautious, you'll end up with split screw heads, screwdriver scars and loose assemblies.

But give that fellow *Phillips* Screws and watch him go — particularly if he was using a hand driver before. With Phillips he can use power drivers — electric or pneumatic — for there's no danger of the driver point escaping from the screw recess. It's just a matter of . . . point the driver . . . and let her go. Phillips Screws drive straight automatically and can be "rammed home" without danger of the heads splitting.

No wonder a changeover to Phillips makes such a difference in output — quality — and employee morale. And the big saving in time also means an average of 50% saving in *cost*.

Write to any of the firms listed below for further facts on Phillips Recessed Head Screws.



PHILLIPS RECESSED HEAD SCREWS

GIVE YOU 2 for 1 (SPEED AT LOWER COST)

WOOD SCREWS • MACHINE SCREWS • SHEET METAL SCREWS • STOVE BOLTS • SPECIAL THREAD-CUTTING SCREWS • SCREWS WITH LOCK WASHERS

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterbury, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.

NEW STANICUT OILS

PARTICULARLY DEVELOPED FOR YOUR WAR-TIME MACHINING PROBLEMS

● IN THE first plants to retool for war production the need for more efficient cutting fluids was soon apparent. To produce parts in the quantities needed and still meet the rigid specifications for accuracy and finish was a problem which cutting oils could help solve.

So, working with these first plants, Standard Oil Engineers developed and tested oils and coolants on many types of jobs. Now, with *many* plants performing the same operations, these newly developed oils are made available to *all* in the new series of STANICUT OILS.

A brief description of three of these oils and the jobs they are doing are outlined below.

STANICUT OILS ARE HELPING TO DO THESE WAR JOBS

FUSE ADAPTERS FOR 37MM. SHELL

Stanicut 62 FC was developed primarily for machining tough aluminum alloys. It gives considerably better tool life and finish than kerosene and lard oil blends commonly used. The higher flash point of this Stanicut Oil reduces the fire hazard.

On an automatic operation, machining aluminum 17 ST for fuse adapters, parts are cut off, drilled, counterbored, formed, drilled, and chamfered at the rate of one each 10 or 12 seconds. Even at this high speed parts and oil run cooler with Stanicut 62. Finish and tool life are good; and reduced carryaway on parts and chips has cut oil consumption one-third.

SLOTTING ENGINE COOLING FINS

Stanicut 107 BC is designed for high speed automatic work on free cutting steels. It is also suitable as a coolant where carbide alloy tools are used, and can be used on high speed machining on copper and brass, without danger of staining the work. Stanicut 107 sometimes works well on harder steels, too, as shown by this unusual case history:

Stanicut 107 BC increased tool life 75% in slotting cooling fins of airplane engine cylinders from 1050 steel tubing. Tool consisted of 18 bits per tool head, spaced 1/8 in. apart. Width of bit 3/16 in. Depth of cut 7/8 in. Feed .002 in. per revolution. Stanicut 107 kept work cool and saved considerable shut-down for tool grinding.

MACHINING NOSE OF 20MM. A. P. SHOT

Stanicut 309 BCS is especially designed for machining soft steels or those which tend to tear easily and make it difficult to get good finish. It may be blended with paraffine oil for less severe conditions. It will, under some conditions, work very well on harder steels, as shown by this case history:

In forming the nose of 20 mm. armor piercing shot from 4150 steel, Stanicut 309 eliminated a grinding operation for finishing. Machining was done on a hand screw machine operating at 485 rpm. Depth of cut approximately .02 in. per revolution with hand feed.

IF YOU HAVE ANY SPECIAL CUTTING OIL PROBLEMS

or if you are just retooling for war work and find it difficult to get the necessary accuracy, finish and tool life on converted machines, call in a Standard Oil cutting oil specialist. See if one of these new oils—and the Engineer's experience in applying them—can help you. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.

STANDARD OIL COMPANY (INDIANA)

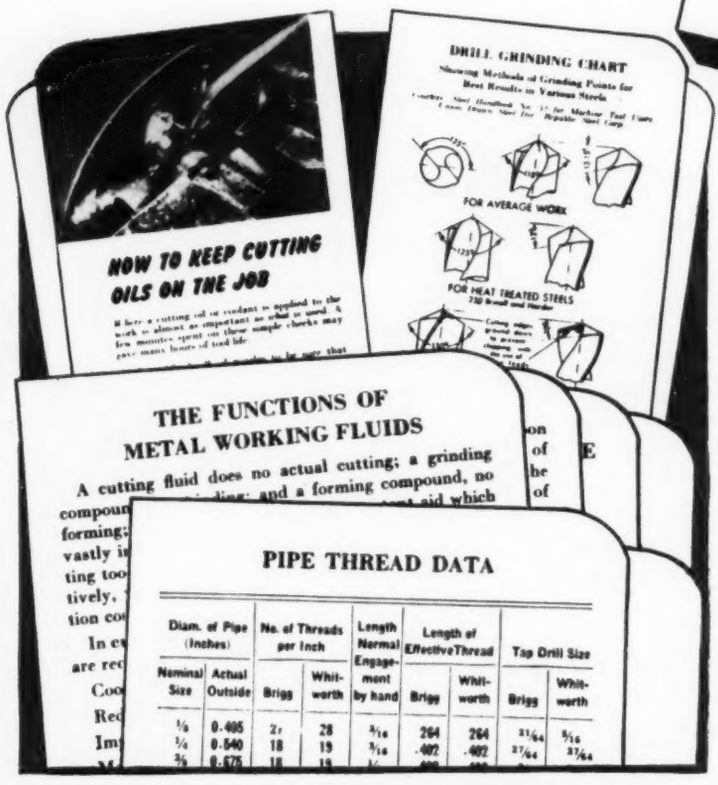
LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION EN

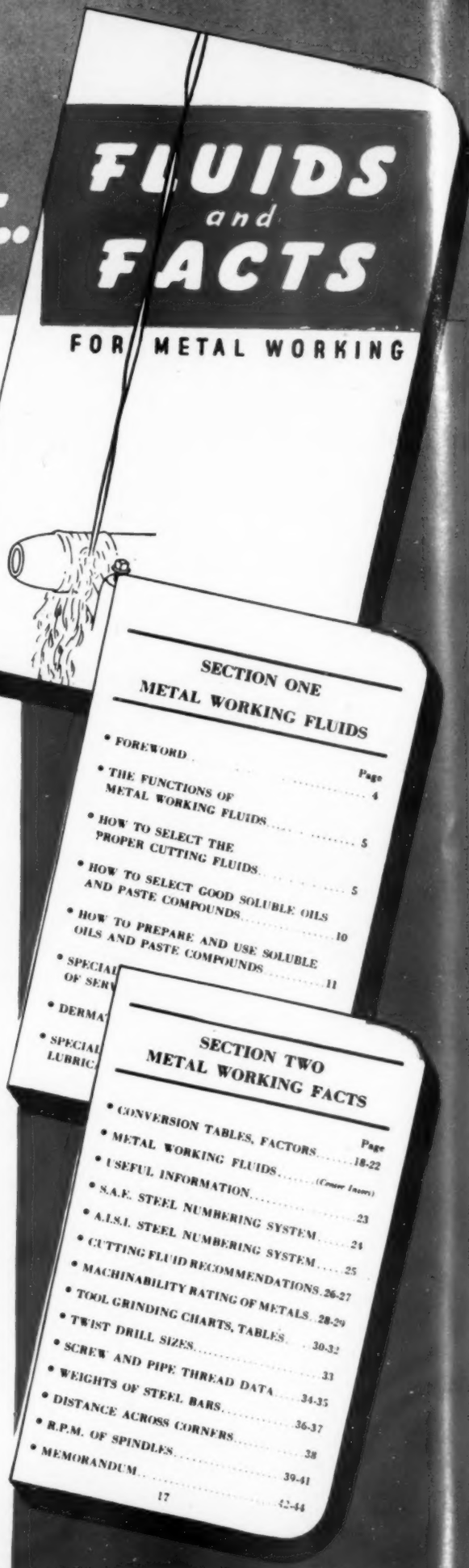
HERE'S HELPFUL INFORMATION ABOUT..

FLUIDS and FACTS FOR METAL WORKING

A CONVENIENT VEST POCKET HANDBOOK

● MEN new to the metal working industry, and many old hands, will find much useful data in this 40-page, pocket-sized booklet. It outlines the need for cutting oils and coolants and suggests qualities to look for in selecting them. Cutting fluid recommendations are given for various types of operation based on machinability ratings of the metal used. Other subjects and tables are shown in the table of contents pages at right.


HOW TO KEEP CUTTING OILS ON THE JOB
DRILL GRINDING CHART
FOR AVERAGE WORK
FOR HEAT TREATED STEELS
THE FUNCTIONS OF METAL WORKING FLUIDS
PIPE THREAD DATA



SECTION ONE
METAL WORKING FLUIDS

- FOREWORD ..... Page
- THE FUNCTIONS OF METAL WORKING FLUIDS 4
- HOW TO SELECT THE PROPER CUTTING FLUIDS 5
- HOW TO SELECT GOOD SOLUBLE OILS AND PASTE COMPOUNDS 10
- HOW TO PREPARE AND USE SOLUBLE OILS AND PASTE COMPOUNDS 11

SECTION TWO
METAL WORKING FACTS

- CONVERSION TABLES, FACTORS ..... Page 18-22
- METAL WORKING FLUIDS ..... (Center Insert)
- USEFUL INFORMATION 23
- S.A.E. STEEL NUMBERING SYSTEM 24
- A.I.S.I. STEEL NUMBERING SYSTEM 25
- CUTTING FLUID RECOMMENDATIONS 26-27
- MACHINABILITY RATING OF METALS 28-29
- TOOL GRINDING CHARTS, TABLES 30-32
- TWIST DRILL SIZES 33
- SCREW AND PIPE THREAD DATA 34-35
- WEIGHTS OF STEEL BARS 36-37
- DISTANCE ACROSS CORNERS 38
- R.P.M. OF SPINDLES 39-41
- MEMORANDUM 42-44

17

ASK YOUR STANDARD OIL MAN FOR A COPY

This handbook is free to operators in the middle western states listed below. Copies are available only through the Standard Oil representative. Take time to see him when he calls—ask him for a copy.

COLORADO • ILLINOIS • INDIANA • IOWA • KANSAS • MICHIGAN
MINNESOTA • MISSOURI • MONTANA • NORTH DAKOTA • WYOMING
SOUTH DAKOTA • WISCONSIN

OIL IS AMMUNITION . . . USE IT WISELY

STANDARD OIL COMPANY (INDIANA

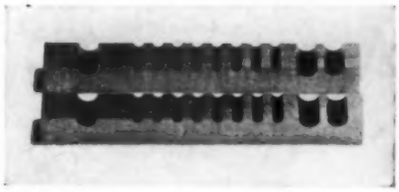
LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATION ENGINEERING • • LUBRICATI

DRESSING IS SIMPLIFIED . . . *by the New Time-saving C-66* . . . RADIUS DRESSER FOR SURFACE GRINDERS

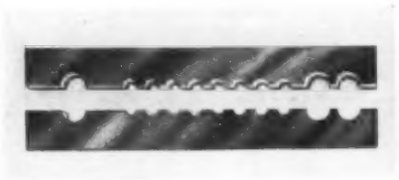
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one hour job in 10 minutes—accurately—conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

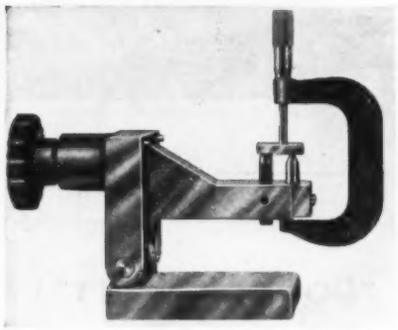
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



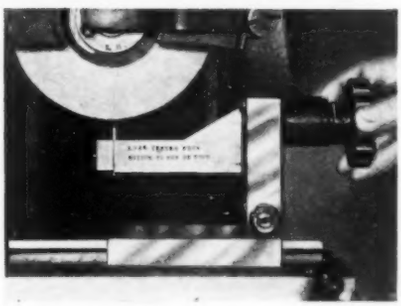
Two High Speed Tool Bits ground for drill jig.



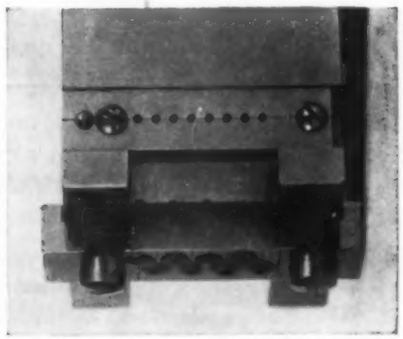
Drill Jig ready to assemble.



The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.

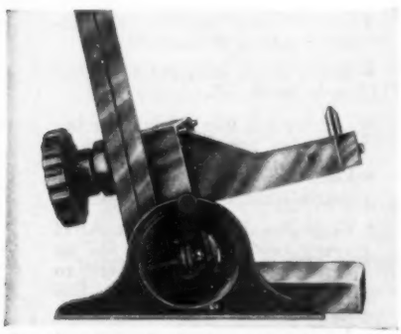


The C-66 provides an important safety feature in that hands are kept away from under the wheel.



Drill jig completely assembled.

The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to 3/8" can be held accurately in line with the vertical center line of spindle.

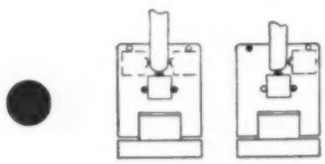


For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

Long Wearing Chisel Point Diamond

.013 Male and Female Radius

.500 Male and Female Radius



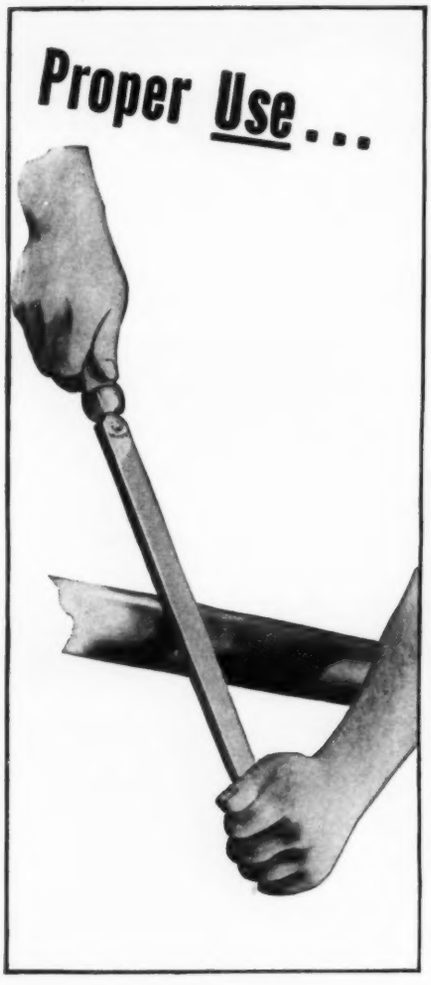
180° and 90° Male Dressing

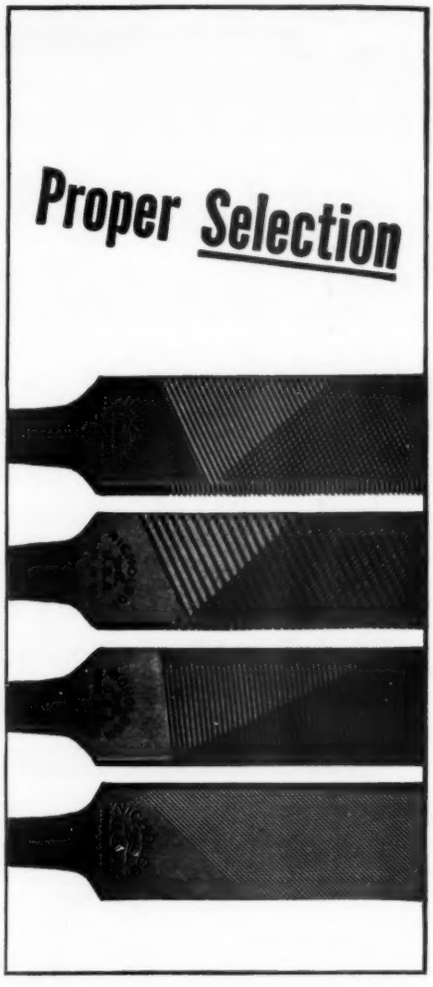
Prompt delivery from factory in Newark, N. J. Price, without diamond, $72.50; 1/4 K diamond, $5.00.

SCHULTZ & ANDERSON CO.

MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.





...saves time—saves materials—saves files

This is a war in which conservation is as important as *production*. It applies to tools as well as to materials and products. And few tools serve more widely than files.

Machine-shop and industrial concerns are having to get along with more and more inexperienced workers. Waste from improper file use, care and selection is becoming a growing problem.

Superintendents and foremen *can* do something about it. Posting or circulating the rules of proper file use and care suggested at the right will help to improve the worker's efficiency, save his time, increase his output, conserve materials, reduce spoiled work, make files themselves last longer (conserving file steels, too).

Nicholson has literature useful as "shop-school texts." Write us on any problem or efficiency program in which our experience with files and filing might be helpful. For your file needs, consult your mill-supply house.

***Free Technical Bulletins** on Nicholson or Black Diamond Special Purpose Files for: Stainless Steel, Aluminum, Brass, Lathe Filing (these four illustrated above), Die and Foundry Castings, Plastics, Die Making, Shear Tooth Filing.

NICHOLSON FILE CO., PROVIDENCE, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ontario)

"DO" and "DON'T"

- Use *The right file for the job.**
- Don't "tear" into the work with too much pressure on the forward stroke.
- Don't "drag" the file back under needless pressure.
- Don't throw files among other tools or objects.
- Don't stack files against, or lay them on top of, one another.
- Keep files dry so rust will not corrode their cutting edges.
- Keep files clean of filings. After every few strokes, tap file on bench or wooden object to loosen chips. Brush file frequently with file brush or card; and always before putting the file away.

NICHOLSON FILES

FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U. S. A.

THE WINNERS!

The 10-round BOUT of the O'TOOLS has ended in a draw! AIR took five rounds. HIGH-CYCLE took five. So they'll meet in a return match.

The outcome of this Bout proves our contentions:

That AIR tools are better suited for some shop situations and HIGH-CYCLE tools are better for others.

The way to be *sure* you get peak production and lowest costs for *your* job is to have the Rotor Analyst give your specific problems an unbiased engineering study with the solution based on the use of *either* AIR or HIGH-CYCLE equipment.

Guess-work and prejudice are *out* when the O'TOOLS have it out!

And now, before the return match, the O'TOOLS are heading for a few skirmishes on the Maintenance Front. Need help along these lines? Call in the Rotor Analyst!

LET'S WHIP YOUR MAINTENANCE PROBLEMS!

This wall chart is part of our ammunition to help you make your tools last longer and give greater output. Charts on both AIR and HIGH-CYCLE tools are free on request.

AIR

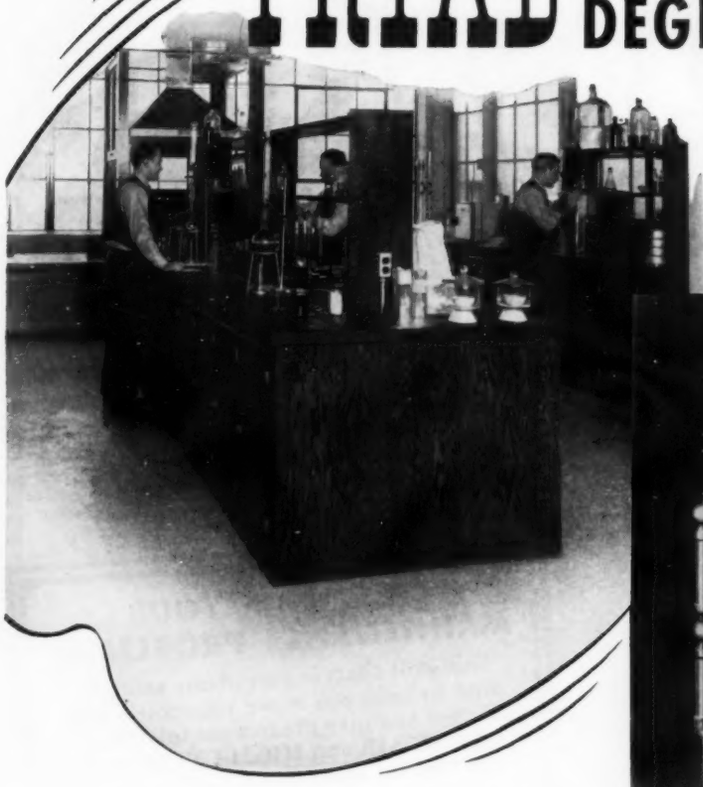
THE ROTOR TOOL CO.

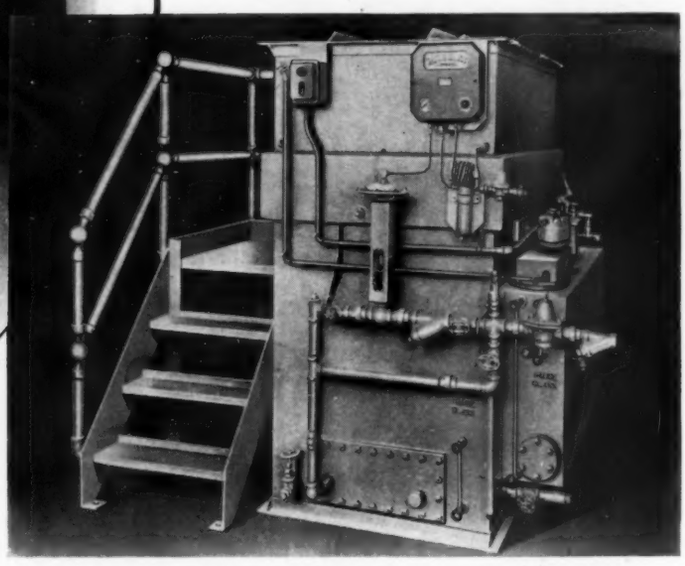
CLEVELAND

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

HIGH CYCLE

Even Today CONSTANT IMPROVEMENT IN TRIAD DEGREASING SOLVENTS *and* CLEANERS





● *Vapor-slush Detrex Degreaser arranged for steam heating and is equipped with vapor level control and operating platform.*

● *Three-stage spray washer with mesh belt conveyor. Incorporates hot alkali sprays, hot water rinse and a hot air blast blow-off.*

● Since Triad chemicals were first introduced, they have been constantly improved. Today, in spite of production demands . . . and the fact that Triad solvents and Triad alkali cleaning compounds are unsurpassed for their specific purposes . . . laboratory work and chemical research continues.

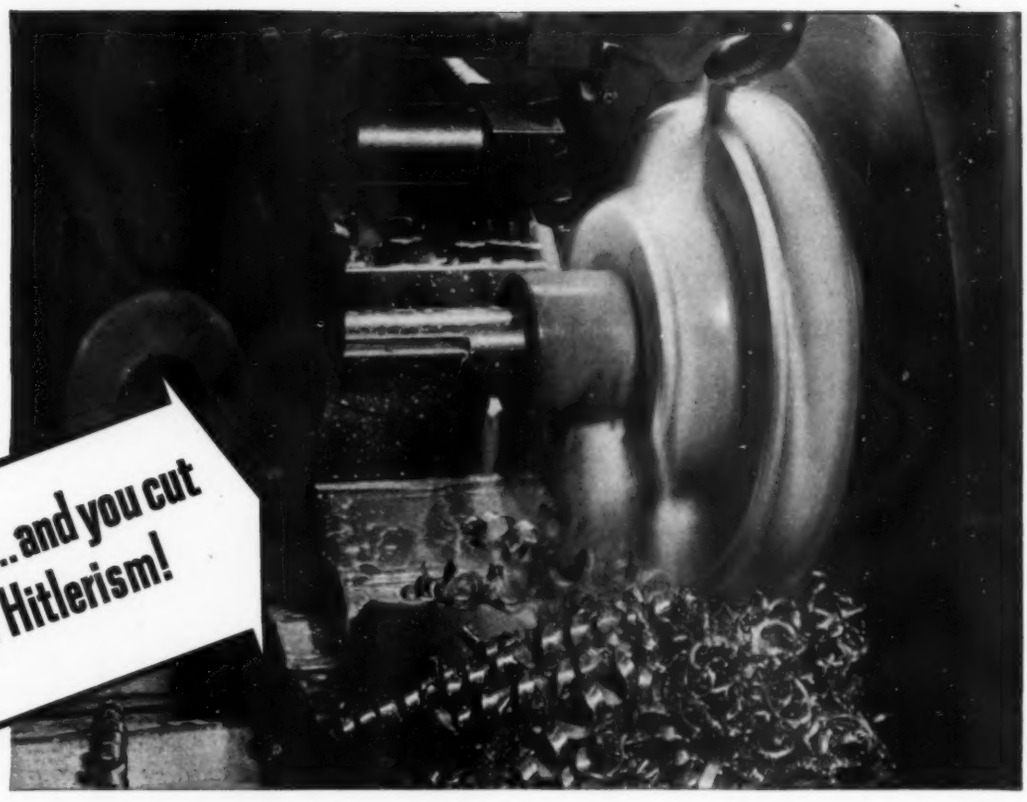
Future changes in various grades of Triad may be minor, or they may be radical. However, you may be sure that any possible improvements which can be useful to your War Production metal cleaning operations will be made.

CLEANING ENGINEERS DETREX DETREX PRODUCTS

DETROIT REX PRODUCTS COMPANY

13023 HILLVIEW AVENUE • DETROIT, MICHIGAN

Branch Offices In Principal Cities of U. S. A.— In Canada: Canadian Hanson & Van Winkle Co., Ltd., Toronto, Ontario



Do More and Do It Better . . with

CITIES SERVICE PRECISION LUBRICATION!

Anything that can be done to speed up production—*must be done.*

And one thing you can and should do is to consult with an experienced Cities Service lubrication engineer for ways and means of speeding up production and improving finish and tool life.

There is no cost nor obligation to you for this consultation. Just phone, write or wire your nearest Cities Service office.

Cities Service cutting oils have stood up to the toughest tests of day-to-day shop operation. That's why more and more wartime producers of urgently needed materials are relying on Cities Service to make every second—*and every dollar*—count!

OIL IS AMMUNITION—USE IT WISELY!

A copy of a booklet useful to all cutting fluid users will be sent on receipt of the coupon below.

CITIES SERVICE OILS
ONCE-ALWAYS

Write to—
CITIES SERVICE OIL COMPANY
Room 1326, Sixty Wall Tower, N. Y.
or any of the following offices:
CHICAGO · CLEVELAND · ST. PAUL
KANSAS CITY · BOSTON · TORONTO
or to
ARKANSAS FUEL OIL COMPANY
SHREVEPORT · ATLANTA · BIRMINGHAM

Please send me your booklet, "Metal Cutting Lubrication." N. P.

Name_____

Firm Name_____

Address_____

City_____ State_____

A LUBRICANT FOR EVERY INDUSTRIAL NEED

MALLORY STANDARDIZED WELDING ELECTRODES

SPEEDIER PRODUCTION

BETTER WELDING

LESS DOWN TIME

LOWER COST

Flash Welding Speeds Rifles for Uncle Sam's Sharpshooters!

In one of the nation's great armories, where new high-speed semi-automatic rifles are produced by the hundreds of thousands, this efficient flash welder works three shifts a day.

Specially designed and built by Thomson-Gibb Electric Welding Co., this modern machine makes the "flashing" operation practically automatic, so that each rifle barrel is welded as strongly and cleanly as the next. And such uniformity is essential, when Uncle Sam's sharpshooters depend on sustained, high-speed, accurate fire power to mow down the enemy!

In this flash welding machine and hundreds of others used to speed output of ferrous and non-ferrous metal products for military and industrial uses . . . Mallory Flash Welding Dies are preferred equipment. Manufacturers of welding machines, welding engineers in scores of industries—the men who write the "specs"—know that electrodes by Mallory assure more welds between redressings, a higher total number of welds before replacement is necessary, and thus stronger, cleaner welds. *Results:* Higher total production speed and lower unit cost.

Other types of Mallory Standardized Resistance Welding Electrodes, including spot welding tips and seam welding rolls, are used for hundreds of important wartime applications . . . from bomber fuselages to generator housings. Welding engineers have learned to depend on Mallory for resistance welding electrodes that will do the job better . . . faster . . . and last longer. Write today for information applicable to your specific resistance welding problems.

MALLORY *Resistance Welding Data Book*—Be sure your engineering files include a copy of this factual, complete treatise on resistance welding practices, alloys and specifications. This book is yours for the asking!

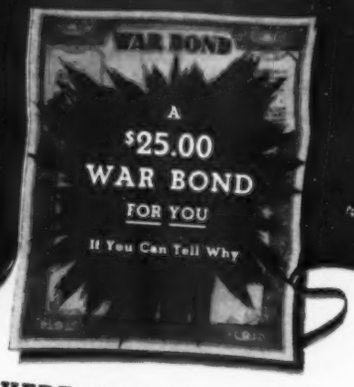
P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA • *Cable Address*—PELMALLO

RESISTANCE WELDING

P. R. MALLORY & CO. Inc.
MALLORY

STANDARDIZED ELECTRODES

"dag"



HERE ARE THE RULES

Acheson Colloids Corporation will give a $25.00 War Bond to each of the 5 people who submit complete and accurate answers together with the 5 best letters on the question, "Why is **'dag'** colloidal graphite important in the manufacture and/or use of the twelve products pictured here?" (1) State business connections (no one in the graphite field or their families will be eligible). (2) All entries must be legible. (3) All entries must state the publication in which the advertisement was seen. (4) Entries must be postmarked not later than January 15, 1943. (5) In case of ties, duplicate awards will be made. (6) Entries become the property of the Acheson Colloids Corp. (7) The verdict of the judges will be final.

Write for NEW BULLETIN 422E on the use of "dag" Colloidal Graphite as a Parting Compound

dag COLLOIDAL PRODUCTS

dag COLLOIDAL PRODUCTS

ACHESON COLLOIDS CORPORATION, Port Huron, Mich.

Simplified Assembly

JIMMY LOU SMITH, VALERIE BILL, LIDIE CROSBY, ALMA GUERARD ASSEMBLING NO. 1-G DRILL GRINDERS IN THE SELLERS FACTORY

ISABELLE DOWLING LAPPING AND ADJUSTING SLIDES OF 1-G GRINDER.

Ease of Operation

SELLERS NO. 1-G DRILL GRINDER

SIMPLICITY ITSELF!

1. INSERT DRILL

2. A QUARTER-TURN OF THE RIGHT HAND CHUCKS IT SECURELY

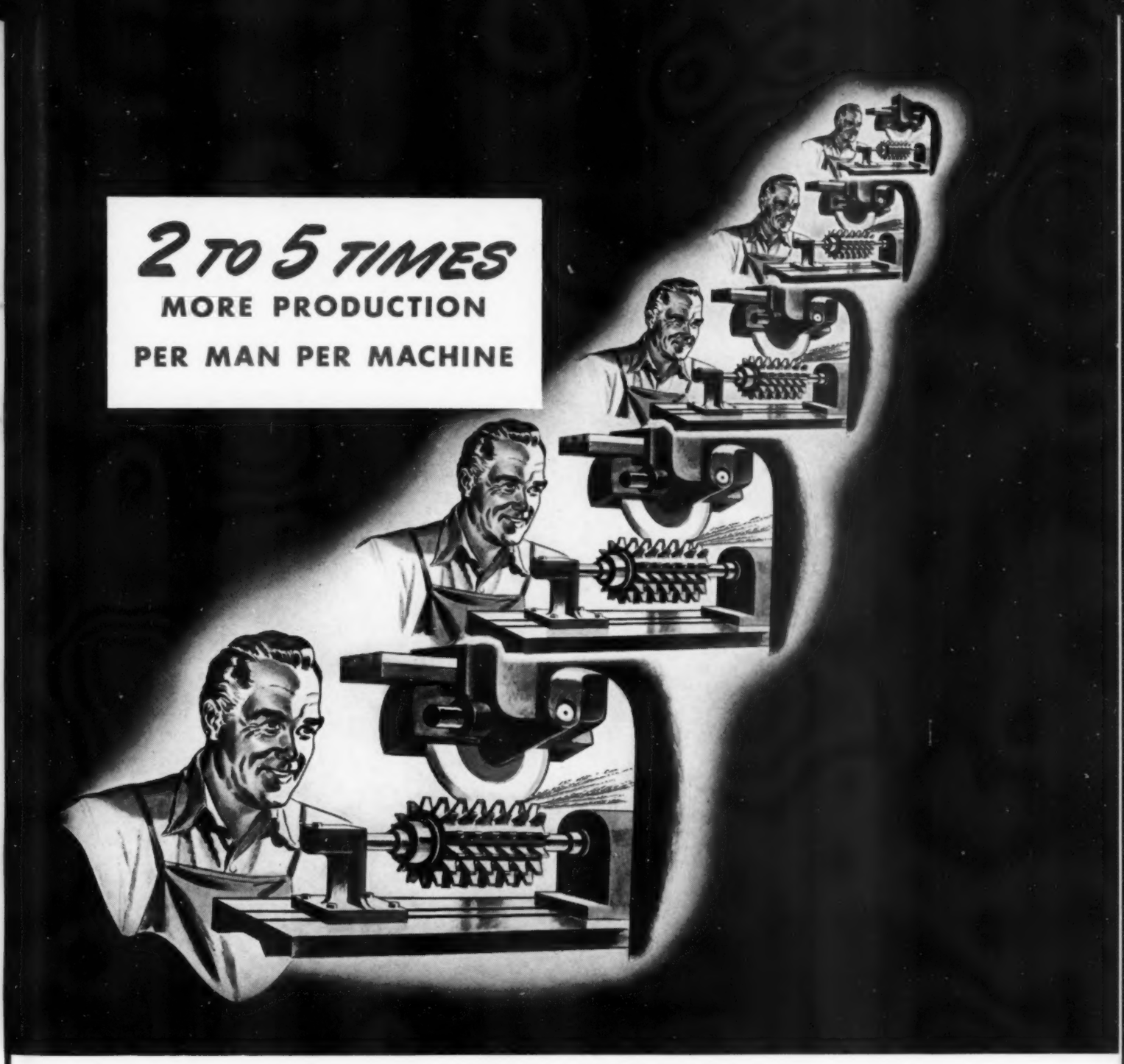
3. MOVE TO GRINDER POSITION

4. GRIND THE SCIENTIFICALLY CORRECT SELLERS POINT

★ **The employment of girls to release manpower for our growing Armed Forces is a new experience for the 94-year-old firm of Wm. Sellers & Co. Only the vital need of the hour could have brought about such a radical change. Yet one of the things that contributed was the very simplicity of Sellers design. That which has been responsible for the precision and ease of operation of Sellers Drill Grinders is making it possible for these young women to assemble these machines with the same accuracy and reliability as the men they have patriotically released for War Service. This same simplicity, combined with precision and ease of operation, is making drill-grinding by girls and other relatively unskilled operators a speedy, accurate job in thousands of factories everywhere.**

WILLIAM SELLERS & CO., INC., Philadelphia, Pa.

Sellers



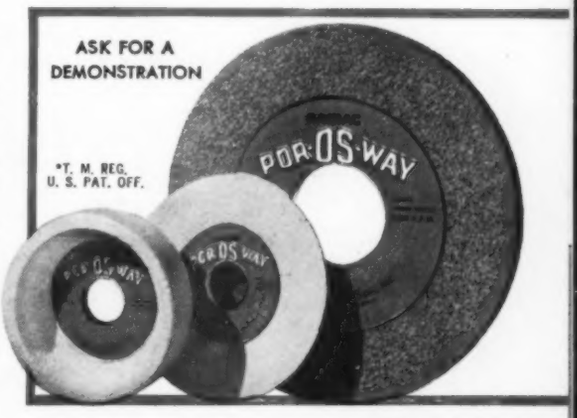
A big promise—to increase grinding production 2 to 5 times—yet you can easily prove it!

NEW IN PRINCIPLE, new in results, Por-os-way is different from any grinding wheel you have ever used. Instead of being sandy or compact, the structure is stringy and porous, like a sponge. The cellular structure, the new bond used, permit faster, cooler, free cutting!

In actual operation, Por-os-way cuts 100% to 400% faster. Deeper cuts are possible . . . .010" or more. Burning is practically eliminated. This is why the wheel, even in inexperienced hands but properly used, increases production per man, per machine 2 to 5 times.

You can prove these results on your own machines. Try Por-os-way on hard tool steels. Try it on copper, tin, wood, and plastics. Loading is reduced to a minimum. The wheel holds the corner and requires very little dressing.

See this new wheel! Por-os-way, developed after three years research by a firm that has specialized in precision grinding for years, is helping greatly to speed up war production. Make a test on your job. Write today for booklet that "tells all". A. P. DE SANNO & SON, INC., 430 Wheatland St., PHOENIXVILLE, PA.



POR-OS-WAY* *a new* **RADIAC* PRODUCT**

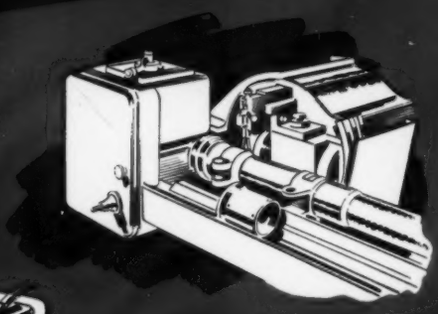
(TURN PAGE, PLEASE)

GRINDS ALMOST EVERY WAY BETTER!

TRY THE AMAZING NEW POR-OS-WAY* WHEEL

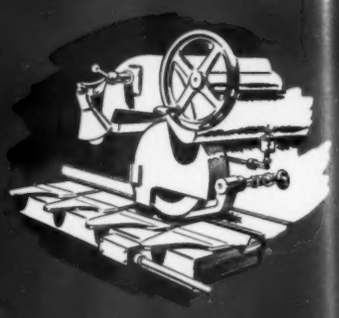
FOR SHARPENING TOOLS AND CUTTERS

Milling cutters, taps, drills, hobs, reamers, lathe tools, broaches, dies, and thread chasers.



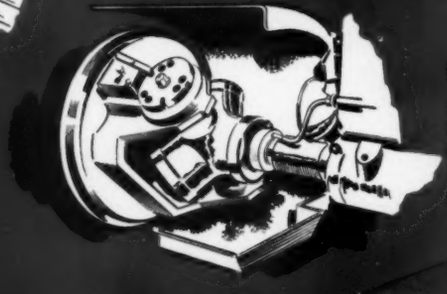
FOR INTERNAL GRINDING

Such jobs as valves, bushings, rollers, armatures, bearings, pinion gears, piston rings, collars.



FOR CYLINDRICAL GRINDING

Including bushings, valve guides, bearings, tubes, shafts, plug gauges, pistons, drills, rollers, commutators.

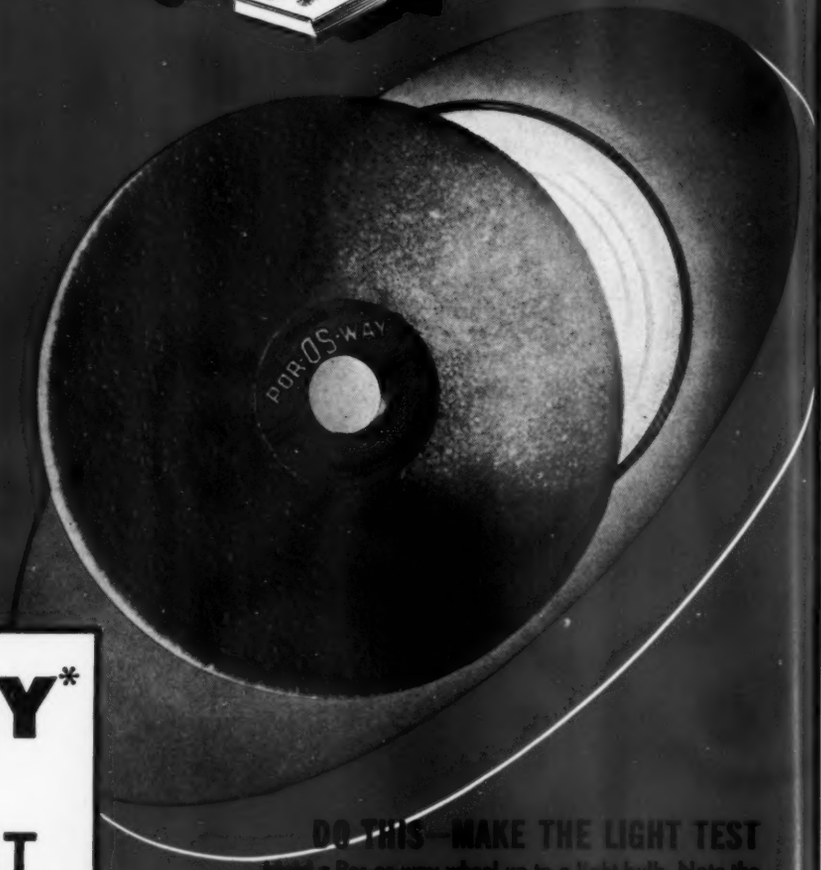


FOR SURFACE GRINDING

Forming tools, castings, blades, punches, forgings, gauges, fixtures, stellite and hardened tools and dies.

Por-os-way is cooler, free cutting, 2 to 5 times faster. See for yourself!

THIS is the wheel that even skilled grinders say is almost too good to be true. Why? Because it breezes through hard tool steel 2 to 5 times faster, takes double or triple the regular cut or more, with practically no vibration, practically no risk of "burning". Yet Por-os-way is equally efficient in grinding copper, tin, rubber, plastics and softer materials . . . even wood. It reduces loading to a minimum. See, try this new wheel. Write for new Por-os-way booklet that "tells all" and includes a "prescription" blank for your own application.



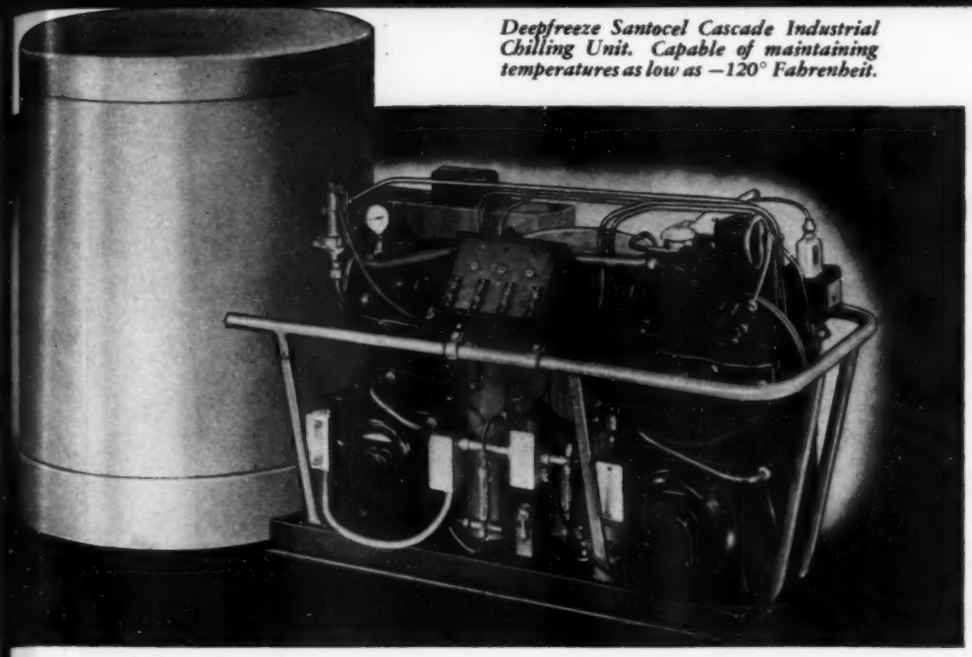
DO THIS—MAKE THE LIGHT TEST

Raise a Por-os-way wheel up to a light bulb. Note the even spread of light. No soft spots to wear away quickly, no dense spots to encourage glazing. The light is evenly diffused. The uniform structure of the wheel gives you uniform wear.

POR-OS-WAY* a new RADIAC* PRODUCT

* T. M. REG. U. S. PAT. OFF.

A. P. DE SANNO & SON, INC., 430 Wheatland Street, PHOENIXVILLE, PENNA. — SINCE 1883
New York, Pittsburgh, Cleveland, Detroit, Chicago, Los Angeles



Deepfreeze Santocel Cascade Industrial Chilling Unit. Capable of maintaining temperatures as low as —120° Fahrenheit.

How to Use Sub-zero Temperatures in Metal Working

. . . Deepfreeze Metal Chilling Increases Production Efficiency in Fabricating Tool Steel, Bronze, Brass, Aluminum and Magnesium Parts . . .

MANY long-recognized metal working problems are finding solution in industry's newest helper—*Metal Chilling.* Among its unlimited uses are the following:

Shrinking of Metal at —100° F. to —120° F. has made it possible to assemble bearings and similar parts requiring a press-fit by merely slipping them into position . . . eliminates spoilage caused by "pounding" bearings into place . . . saves time caused by delay in replacing bearings . . . saves cost of expensive equipment.

Another application is in chilling aluminum alloy rivets 17S-T and 24S-T to retard aging. Rivets can be kept soft enough for driving for a period of over two weeks.

Testing of Metals at —100° F. to —120° F. has made it possible to study the reactions of aircraft instruments to stratosphere flying. Aircraft engine lubricants can also be pretested for sub-zero flying. Tests are usually conducted over a 6 or 8-hour freezing period.

Treating of Metal at —100° F. to —120° F. will produce combinations of hardness, strength and ductility not obtainable by ordinary hardening or tempering. "For treatment of high-speed steel, temperatures colder than —150° F. are ineffective. Temperatures *warmer* than —100° F. are also ineffective."

The Deepfreeze Cascade Unit is capable of maintaining —120° F., making it ideal for the proper treatment of high-speed steel.

Removes 1000 B.T.U.'s Per Hour at —120° F.

Effects Savings Up To $2825 Per Year Over Dry Ice

In addition to eliminating the inconvenience of handling dry ice, the Deepfreeze *Cascade* Chilling Unit produces and maintains a temperature substantially 29 degrees colder. Laboratory tests prove that the cost for removing 1000 B.t.u.'s per 24-hour day over a period of one year with dry ice is $3000.00, as compared to the $175.00 electric current consumption of the Deepfreeze over the same period of time.

THE DEEPFREEZE STANDARD CASCADE INDUSTRIAL CHILLING UNIT has a chilling chamber 24" in diameter by 30" deep. It is equipped with two motors and two compressors of the silent-valve-head, water-cooled, piston type. It has a heat absorbing capacity equivalent to 196 lbs. of dry ice per 24-hour day under similar operating conditions.

The same standard unit can be furnished 60" deep or deeper.

Special Units Designed for Specific Needs

In addition to the standard Deepfreeze units, special units can be designed to suit specific applications. Extra deep chilling compartments have been furnished for shrinking airplane retractable landing gear parts in assembly. Many other designs are being furnished, each to suit a specific problem.

Other special designs have been furnished for desiccating blood plasma, shell freezing blood plasma, and for testing aircraft instruments at all flying levels and temperatures.

FREE ENGINEERING ASSISTANCE

Deepfreeze engineers are available to assist you in obtaining the advantages of sub-zero metal conditioning. Send us an outline of your problems, together with parts or prints for a preliminary calculation and test—no obligation.

FREE DATA *and proof of the outstanding success of the Deepfreeze method for chilling metals is included in this booklet. Write for your copy today.*

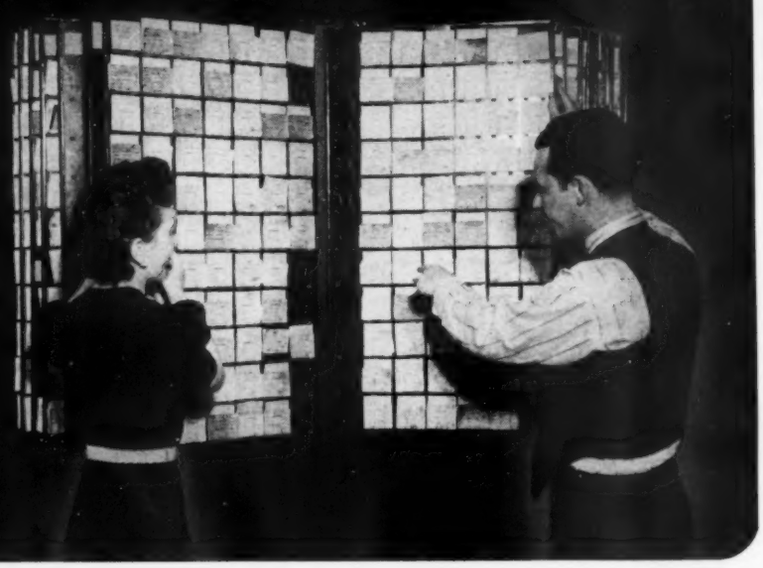
Deepfreeze

DIVISION

MOTOR PRODUCTS CORPORATION

2327 DAVIS STREET, NORTH CHICAGO, ILLINOIS

OVERDUE ORDERS REDUCED 78% with McCASKEY PRODUCTION CONTROL in the first few weeks of operation



ABILITY to forecast delivery dates and check production to assure on-time deliveries caused constant concern in the plant of a well-known manufacturer of power transmission equipment until recently. Some idea of their situation is evident from the fact that this company operates 70 classes of machines and averages approximately 1300 unfilled orders with 500 in operation at one time.

To achieve their objective it was necessary to provide a machine load record showing the hours of work assigned ahead for each machine or group of similar machines, departmental work assignment in the shop in proper sequence for established schedules, and progress records instantly available to show the current status of each order.

Adoption of the McCaskey system of Production Control provided all the information desired and also brought to light glaringly unsatisfactory conditions which in the first few weeks of installation and operation were corrected to the extent of reducing overdue orders from 192 to 42. With the full operation of the McCaskey system overdue orders will be entirely eliminated or under control.

A McCaskey representative, qualified by training and experience, is available to help you work out your production control requirements. Call him in. No obligation, of course.

TYPICAL NEEDS SATISFIED BY McCASKEY PRODUCTION CONTROL

. . . Flow of finished parts coordinated to avoid assembly delays resulting from missing units.

. . . Progress record showing immediate status of any or all orders *at a glance.*

. . . Forecast of production delivery.

. . . Overdue orders eliminated or under control.

. . . Machine scheduling, departmental machine loads and job assignment to keep all machines busy all the time and run jobs in proper sequence.

. . . Check of machine production to assure realization of production standards.

. . . Production follow-up without dependence on stock chasers.

. . . Day to day cost and payroll data for immediate control of unexpected increases.

. . . Unified control of inventories of material, purchased parts, parts produced, sub-assemblies, tools, supplies, etc.

. . . Tool crib control providing more production with less tools.

These typical control objectives suggest in general what may be accomplished through McCaskey. Although the specific needs of plants and departments differ, the flexibility of McCaskey Production Control makes it adaptable to practically any of the severe production conditions existing today. You name your requirements and McCaskey will satisfy them.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

to help Finish 'em Over There!

Grinding Steel Tubing before welding for airplane engine mount, on a B & D 10" Ball Bearing Bench Grinder.

Black & Decker Electric Sanders, Portable Grinders and Bench Grinders are speeding finishing operations all along the production front . . . smoothing welds on Army trucks and tanks . . . grinding castings for vitally needed cargo vessels and warships . . . cleaning, smoothing and polishing metal . . . removing paint, rust and scale . . . rubbing and buffing all types of finishes . . . *all* at war emergency speed.

These fast, versatile Sanders and Grinders are built and powered for continuous, heavy duty production. And other Black & Decker Electric Tools, equally rugged and efficient, are working right along with them—speeding such jobs as drilling and tapping, screw driving and nut running, sawing and sheet metal cutting—saving precious hours over here that will hasten the finish over there.

☆ ☆ **GET IN THE SCRAP WITH YOUR SCRAP** ☆ ☆

Smoothing Welds on the frame of a trailer for Army transport service with a Black & Decker 6" Portable Electric Grinder.

Here's Help—in a Hurry! *For advice on any tooling problem, call your nearby Black & Decker Distributor. He's dependable, convenient — ready to serve you as a source of supply or as a tool information expert. The Black & Decker Mfg. Co., 716 Pennsylvania Avenue, Towson, Md.*

Get this extra assurance when you plan

WAR PLANT FLUORESCENT LIGHTING!

Set up by lighting experts of the MAZDA Lamp makers, these rigid specifications guide the manufacture—by over 40 leading fixture makers—of the famous Certified FLEUR-O-LIER fixtures . . . assure you of electrical, mechanical and lighting excellence.

FLEUR-O-LIERS are tested and Certified by impartial experts (Electrical Testing Laboratories, Inc., of New York) as providing the precise qualifications that mean so much to war production men: maximum light output—ease of maintenance—full use of wiring systems—as well as many other vital points that assure reliable lighting performance. *Look for the label* on the fixtures you specify for essential war use.

Get this valuable guide to use when you plan or specify fluorescent lighting for war work. Write NOW for the booklet shown above. FLEUR-O-LIER MANUFACTURERS, 2133-12 Keith Building, Cleveland, Ohio.

NON-FERROUS REFLECTORS

Many FLEUR-O-LIER Manufacturers have already made available Certified FLEUR-O-LIER fixtures using non-ferrous reflectors which meet the requirements of WPB Limitation Order L-78 (Amended). They are now sold only on an A-1-j priority or better. Check with your electrical distributor, contractor or local electric company for full details.

FLEUR-O-LIERS

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

Useful tool for heat-treaters

Chart shows heat and temper colors of steel

If you heat-treat or temper steel, we invite you to write for this free heat-color and temper-color chart.

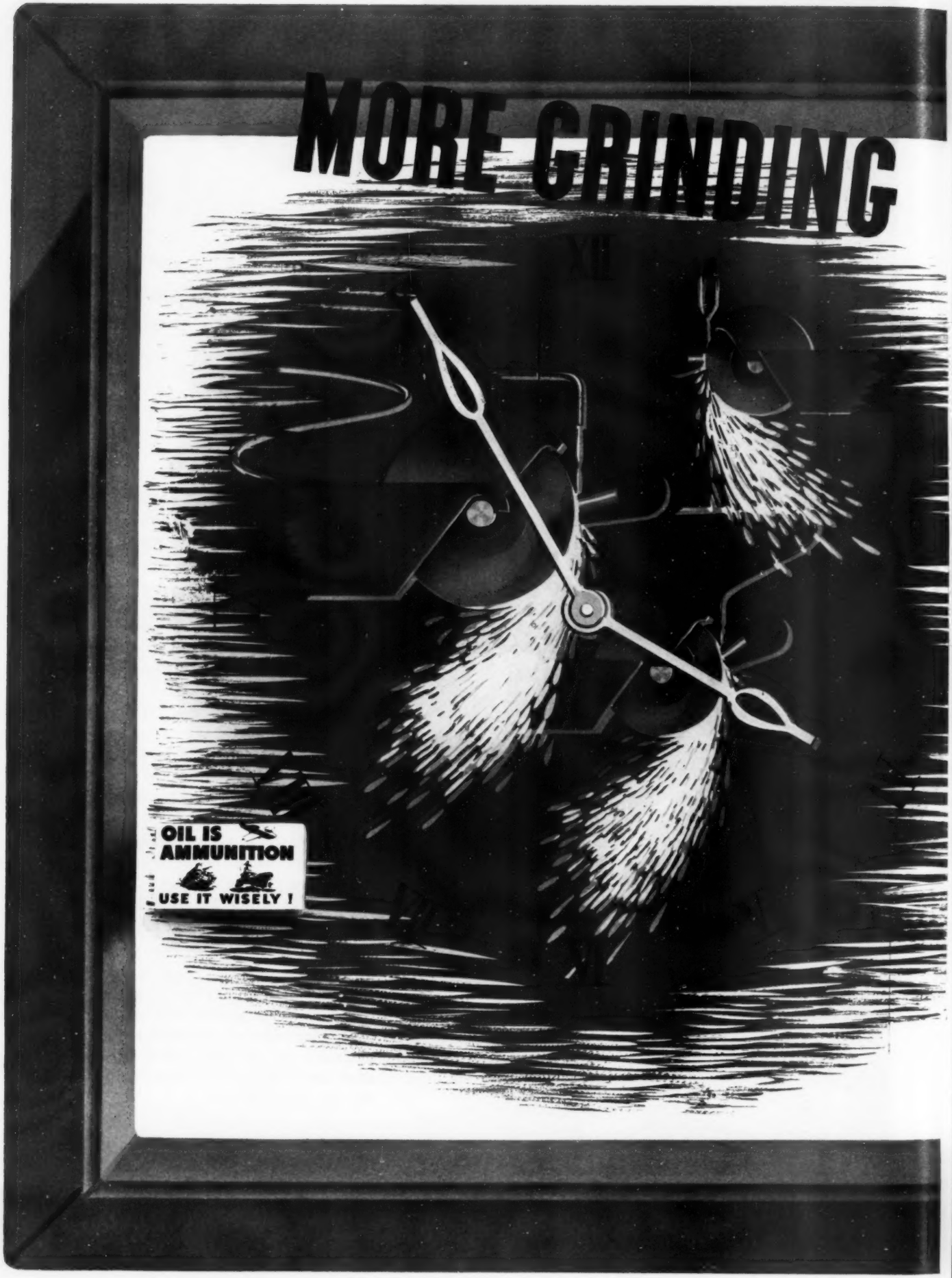
It gives you a quick means of checking the temperature of a piece of steel by its color. The chart is composed of two parts—a slide and a holder, the holder containing an observation slot. On one side of the slide are faithful reproductions of the color changes undergone by a piece of steel when raised by 100 deg. F. steps from 1000 deg. to 2500 deg. F. The other side of the slide illustrates the temper colors of steel at 40 deg. F. intervals, from 380 to 700 deg. F.

To operate the chart, simply draw the slide up or down inside the holder until the desired color appears in the observation slot. Temperature, in either Fahrenheit or Centigrade, can then be read directly at the sides of the slot.

This guide has already been used successfully by many operators. Now, with hundreds of new men moving into jobs involving the handling of tool steels in war plants, it should be more helpful than ever before. If you could use this chart write for one to Bethlehem Steel Company, Bethlehem, Pa., using your company letterhead. No cost or obligation.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY


MORE GRINDING
XII
OIL IS AMMUNITION
USE IT WISELY !

FROM FEWER WHEELS...

in less time...

Work spoilage ran high, frequent dressing of grinder wheels was necessary. Rough grinding, centerless grinding and finishing were all slowed down. Then this important defense plant changed to Tycol 665 Oil, a product engineered for grinding.

Work now comes out on schedule. Grinder wheels require fewer re-dressings – last longer. A production leak has been plugged.

This instance is like hundreds of other tough applications where the proper use of Tycol Oils means dollars saved in machining and grinding costs. Tycol cutting lubricants are available to meet all requirements in the machining of both ferrous and non-ferrous metals. Their use assures quality production and better machine efficiency.

Let a Tide Water Engineer show you where economies can be made in your lubrication. Write the Tide Water Associated Oil Company, 17 Battery Place, New York, N. Y.

DRUMS! DRUMS! DRUMS!
War needs make it extremely important that all empty drums be returned immediately.

TIDE WATER ASSOCIATED OIL COMPANY
EASTERN DIVISION: 17 BATTERY PLACE, NEW YORK
Principal Branch Offices: Boston, Philadelphia, Pittsburgh, Charlotte, N. C.

MAKERS OF THE FAMOUS VEEDOL MOTOR OIL

New

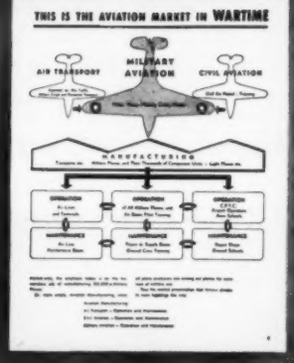
from the Index . . .

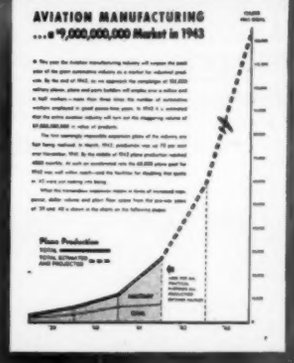
Aviation — the Market

The structure of the aviation industry.... 3
What the aviation industries buy.....11-13
How prime contractors subcontract..... 20
Future Air Transport- all-purpose carrier.. 23
Tomorrow's private flying..... 28
Organization of Army & Navy air forces.. 29

Aviation — the Magazine

Information for every industry interest.34-35
Going-to-the-source-of-the-story methods. 46
Concentration on the Men Who Buy....50-51
First-hand evidence from key readers..... 56





Aviation Facts Book

An up-to-this-minute file of marketing information prepared by the Research Department of Aviation

WHAT are the facts of today's aviation market? What does the industry buy . . . and what are the sales possibilities for *your* product? Who are the important buying influences to consider in selling and subcontracting to airframe manufacturers, engine builders, parts and equipment suppliers? What is the wartime status of air transport — of civil aviation?

Most challenging question — what are the post-war market potentialities of the aviation industry?

These are some of the questions uppermost in the minds of foresighted business men today. These are a few of the questions this booklet treats *factually* and *objectively*.

We believe this study to be the most informative and up-to-the-minute presentation of aviation market facts obtainable. Within the limits of publishable information it is accurate and unusually comprehensive.

The method of reaching this market

Equally as important as *what* comprises the market is *how* that market can be reached.

Thus the latter half of the booklet offers a thorough analysis of *Aviation*, the prime method of sales communication with the executives of the aeronautical field.

Here in concise, readable, easy-to-analyze form is a clear presentation of the editorial policy and purpose of *Aviation*—a demonstration of its daily usefulness to the men who are building our air strength today and who will build our air commerce tomorrow.

Designed for analytical sales executives and advertising buyers, the circulation section of the booklet shows clearly how *Aviation*'s circulation thoroughly covers the industry's buying power. How it is directed to the men you must sell, the executives who have the yes-or-no in purchasing decisions in aviation's manufacturing, operating and maintenance divisions—and that important group—the government and military authorities concerned with aviation activities.

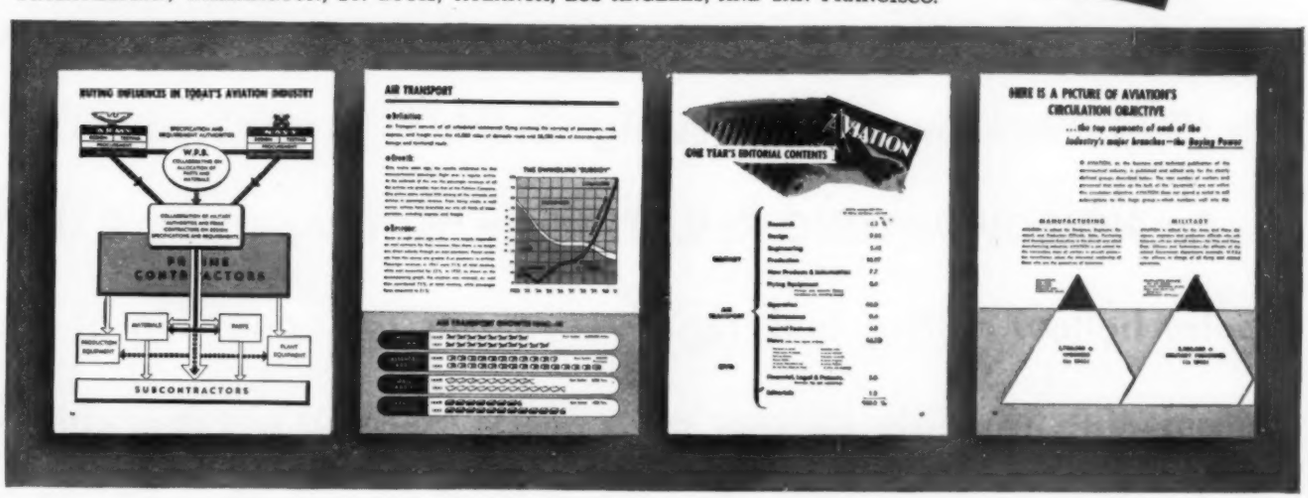
To interested executives, a copy without cost or obligation

A limited quantity of these booklets is now available to advertising and sales executives. A request on your business letterhead will bring your copy promptly. Address Market Research Department of *Aviation*.

AVIATION

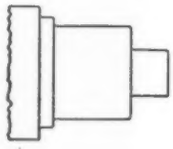
A McGraw-Hill Publication • ***336 West 42nd Street, New York, N. Y.***

OFFICES IN CLEVELAND, DETROIT, CHICAGO, BOSTON, PHILADELPHIA, WASHINGTON, ST. LOUIS, ATLANTA, LOS ANGELES, AND SAN FRANCISCO.



How to Speed Up War Work WITH N

The circular cutters and their holding blocks have been removed from this Namco Self-Opening Head to demonstrate its double duty use.

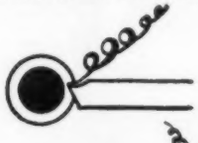
For example, if you had a *hollow milling* job like this 

you'd put in a set of 4 circular tools like this.

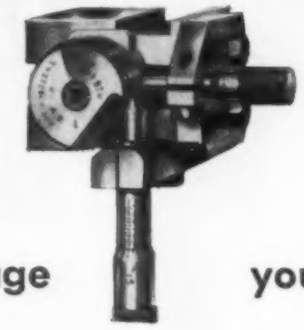
Hundreds of other hollow mill forms for irregular and straight end turning work are replacing ordinary milling tools in shops where uninterrupted output is vital to war schedules.

When you have a *threading* job within the capacity of the same head, you can quickly switch to ground circular chasers.

This double duty service is one exclusive Namco feature that saves in tool investment and insures high precision at peak output.

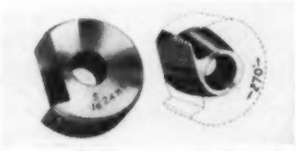
For HOLLOW MILLING RESULTS make this comparison: A single point hollow milling tool  cuts only one chip at each pass. With multiple circular mills you get four chips—easily 3 TIMES FASTER CUTTING.

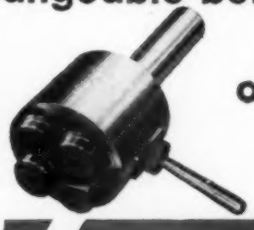
NAMCO *Double-Duty* AUTOMATIC HEADS



AVOID DOWN-TIME AND SCRAP LOSS— When you grind circular hollow mills (or circular chasers) you check them with this micrometer gage you check to exact cutting edge dimensions, you know in advance of use that all four cutting edges are uniform and will produce tolerances identical with those before grinding.

Many users of Namco heads on war production schedules carry extra sets of hollow mills for the job, grind them in the tool room in advance—then make the change on the job in 2 MINUTES.

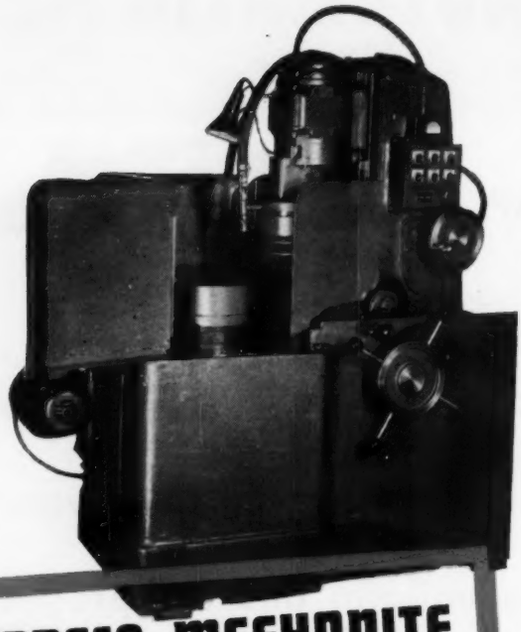
WHAT ABOUT COST? You grind and regrind circular hollow mills or chasers  to a full 270° of their circumference. This means 20 to 30 *times* longer life, which pays many times over for the difference in first cost.

THEN TOO— Circular hollow mills, like circular chasers are interchangeable between revolving and non-revolving heads  of like capacities. *Ask for D-42 Catalog.*

THE NATIONAL ACME CO

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • SOLENOIDS • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING



ABSCO MEEHANITE

Helps this Grinder Meet Today's Severe Requirements

To assure its customers a vertical rotary surface grinder that meets today's requirements for power, speed, accuracy and durability, the Portman Machine Tool Company of Mt. Vernon, N. Y., uses ABSCO Meehanite Castings in the construction of its No. 12 Portman Grinder. These castings provide the proper combination of strength and toughness necessary to withstand severe shock and strain. Notable weight and space savings are effected through the use of ABSCO Meehanite for these castings.

Through our Selective Processing, a type of ABSCO Meehanite is available to fit your needs for any of these qualities:

1. **Strength, toughness and high damping capacity.**
2. **Ability to stand shock or strain.**
3. **Free machining qualities.**
4. **Density and solidity for pressure castings.**
5. **Heat and corrosion resistance.**
6. **Freedom from warpage that means constant alignment.**
7. **May be heat-treated for higher tensile strengths and increased resistance to wear.**

Here's a tip: Send for Machine Tool Bulletin No. 9, mailed free on request, or let our technicians show you how ABSCO Meehanite will help solve your problem.

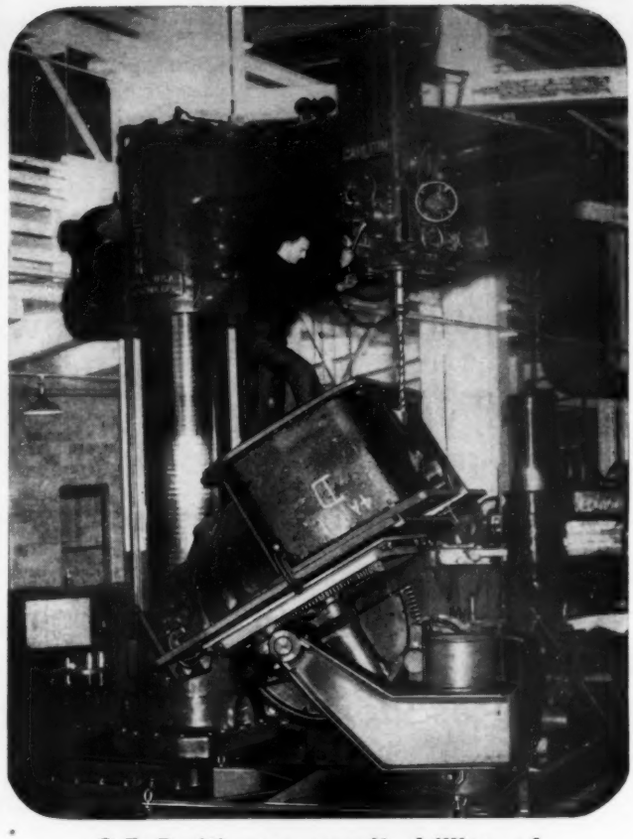
3175

THE AMERICAN BRAKE SHOE AND FOUNDRY COMPANY

BRAKE SHOE AND CASTINGS DIVISION

FOUNDRY
MAHWAH
NEW JERSEY

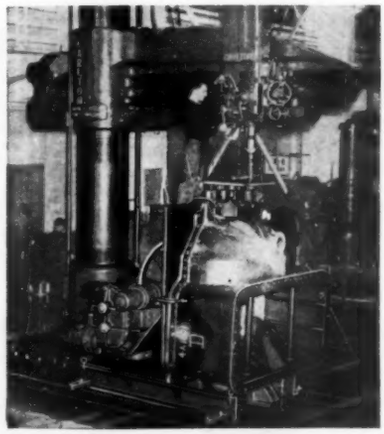
OFFICES
230 Park Avenue, New York, N. Y.
332 South Michigan Ave., Chicago, Ill.



C-F Positioners permit drilling of all sides, at all angles with one set-up.

★ ★ ★ ★ ★ ★

Designed and widely used to revolve and tilt cumbersome weldments so that all surfaces can be welded "down hand," C-F Positioners are now also being used to reduce setting-up time and expense in the machine shop. Because they will hold work in any position, revolve it completely around and tilt it at any angle up to 135° off horizontal, a C-F Positioner enables one to drill both straight and angular holes on all sides and in the top of the giant steel casting illustrated, with only one set-up.



After drilling angle hole, the Positioner, with the push of a button, tilts work to 90° to drill side and revolves it in this plane so that side can be drilled in turn.

CULLEN-FRIESTEDT CO.
1313 S. KILBOURN AVE. CHICAGO ILLINOIS

INDUSTRY IS ON AN EIGHT-DAY WEEK

Seven days a week America is doing one of the greatest jobs of production the world has ever known. We are living with one part of that job here at Alcoa, where over seventy thousand men and women are producing Aluminum in quantities that were mere fantasy yesterday.

But there's an eighth day tucked in among the few open spaces in the seven-day week. Engineers are able to squeeze in some important Imagineering about post-war products—planning that will help convert war jobs into peace jobs.

For instance:

Imagine what 1,000 pounds less weight in the automobile of the future would mean in performance, gas economy and tire life. Then engineer it down to the realization that 1,000 pounds *can* be taken off by using, say, 500 pounds of Aluminum per car.

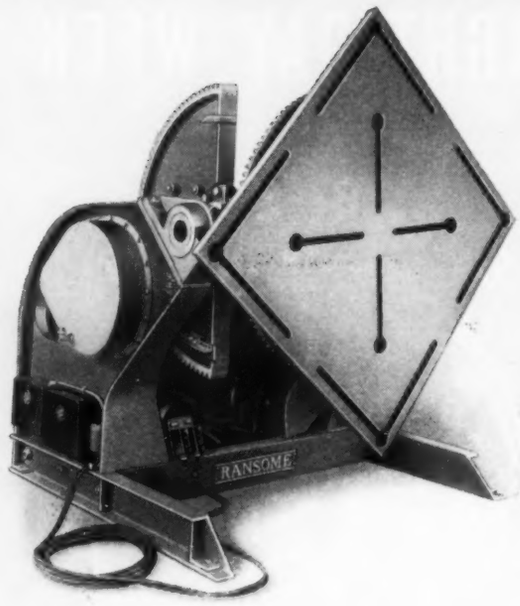
Now translate possibilities such as these into your own business.

Aluminum costs less today. New methods, techniques, processes, and new forms of metal coming out of the war effort will all be available for the as-yet-untold possibilities in tomorrow's peacetime products and peacetime services.

Our eighth day is devoted to helping Imagineers throughout industry use the potentialities of Alcoa Aluminum in bettering the new ideas they are dreaming up. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

FOR ALL DOWNHAND WELDS • • •



a tilting range of 135 degrees from horizontal

Ransome Positioners provide the means to weld DOWNHAND any and all welds no matter how complicated the piece to be welded.

Reports from many users indicate valuable time savings . . . which means more welding production in a given time over methods formerly used. Give us your welding production problems—our engineers will supply the answers.

From light duty hand-operated type to 20 ton capacity motor-operated.

Ransome WELDING POSITIONERS

INDUSTRIAL DIVISION • RANSOME MACHINERY COMPANY • DUNELLEN, NEW JERSEY

Grit in coolant ruins grinding jobs!

Eliminate it with SPARKLER HORIZONTAL PLATE FILTERS

4 REASONS FOR SPARKLER'S READY ACCEPTANCE—

(1) Faster Cutting
(2) Superior Work
(3) Less Wear and Tear on Wheel
(4) Economizes on Oil

Your grinding wheel may scratch or cut deeper than intended if grit accumulates in the coolant. Sparkler Filters remove all abrasive substances, purify and refine oils and reclaim them for repeated use. Definitely improve the work in all types of precision grinding, including gun breech and any plunger work where metals must be perfect.

Sparkler Filters can be reset or changed in less than three minutes, have plenty of cake space, are simple to operate, inexpensive to own and maintain.

We will gladly demonstrate what the Sparkler will do right in your plant, without cost or obligation. Write for full details.

SPARKLER MANUFACTURING COMPANY

273 LAKE STREET **MUNDELEIN, ILLINOIS**

Model No. 14-D-4
FILTERS 900 G. P. H.

SPARKLER FILTERS
WITH THE HORIZONTAL PLATES

1 PINT TO 10,000 GALLONS PER HOUR

THIS "BABY" GETS 17 BATHS

That Help *SPEED-UP* Production and *INCREASE* Output!

This is a cal. .50 machine gun cartridge designed to shred aircraft armor, strafe landing barge personnel, find the vitals of reconnaissance cars and scythe down advancing infantry.

It will take a lot of these to win the Victory and it takes over 70 operations to make each one... to form and assemble its case, its primer with cup, pellet and anvil, its bullet with point, core and jacket. Between these and other operations are 17 cleaning jobs... not just cleaning to wash away dirt and metal chips but also, to remove a variety of drawing, forming and cutting oils, compounds and greases. The cleaning has to be THOROUGH. It has to be FAST.

This essential production degreasing is a typical example of Oakite War-Time Service to Ordnance Munitions makers. For many we have solved other difficult problems, in some cases setting up over-all individual plant techniques of specialized time-and-man-power-saving cleaning operations.

CAN YOU USE THIS VALUABLE FREE SERVICE?

If, in your plant, there is a cleaning operation suspected of being less thorough than it should be or of taking even a few more seconds time than necessary, let a nearby Oakite Technical Service Representative take a helpful look at the situation. His FREE services... a contribution to the Nation's war effort... are yours for the asking. Write today!

A FEW OF MANY CASES WHERE OAKITE MATERIALS AND METHODS ARE BEING USED TO SPEED-UP PRODUCTION OF ORDNANCE AND MUNITIONS

STEEL SHELLS: *Removing machining oils, soluble cutting and grinding oils, graphite, heat treat scale, shop dirt and smut. Neutralizing after scale removal. Rust-proofing after boring, cold nosing, scale removal, grinding and cleaning. Cleaning before re-loading, removing acid-proof paint, red lead, oxide, grease and rust.*

STEEL DEPTH BOMBS: *Removing anti-rust, blanking oil, light rust and welding scale.*

TORPEDO CASINGS: *Removing quenching oil and heat treat scale. Rust-proofing prior to shipping for assembly.*

STEEL BURSTER TUBES: *Removing slushing oil and rust.*

BRASS BURSTER CASES AND FUSE PARTS: *Removing lard oil, metal chips and discoloration.*

BRASS CARTRIDGE CASES: *Forming with Oakite Special Drawing Compound. Removing drawing compound, heat treat scale and pickling acids.*

ALUMINUM BOOSTER CAPS: *Removing lard oil.*

STEEL INCENDIARY BOMB CASES: *Removing silver soldering flux, oxides, heat scale, rust and discoloration.*

CARTRIDGES: *Removing blanking paste, lard oil, soap tallow, and soap from brass cases and bullet jackets.*

GUN BARRELS: *Removing burned on powder after test firing.*

LANDING FIELD STEEL MATS: *Stamping steel sheets with Oakite Special Drawing Compound.*

STEEL BOOSTER CAPS: *Reverse Current Degreasing before zinc plating.*

RIFLE PARTS: *Electrocleaning Method of removing oil and burned powder after practice firing.*

ANTI-AIRCRAFT SHELL CASES: *Removing machining oil, castor oil, soap and drawing compound.*

Manufactured only by

OAKITE PRODUCTS, INC., 24 Thames Street, NEW YORK, N. Y.

Representatives in All Principal Cities of the United States and Canada

OAKITE CLEANING

MATERIALS...METHODS...SERVICE

FOR EVERY CLEANING REQUIREMENT

...NOW STEPPING UP WAR DELIVERIES

1. They save the worker's time

Each nut is a self-contained easy-to-handle unit that goes on fast . . . and its self-locking action is immediate and automatic.

2. They eliminate the dangers of careless assembly

The locking element is built into the nut . . . no pins, wires, washers, or shims that can be forgotten or incorrectly applied.

3. They reduce inspection needs

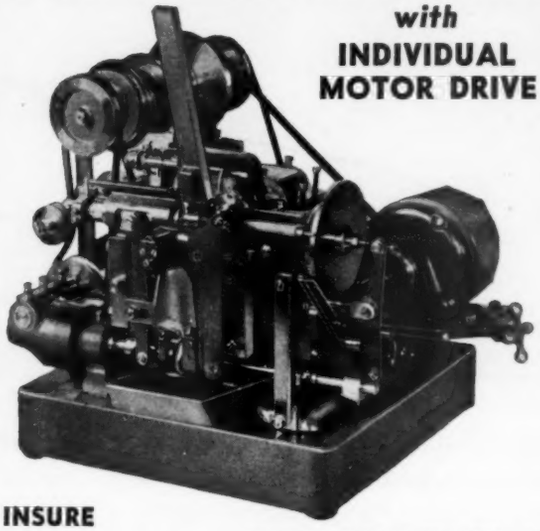
With less operations and less parts to be checked . . . there's another important saving in man-hours.

There are more Elastic Stop Nuts on America's airplanes, tanks, guns, Naval vessels, and production equipment, than all other lock nuts combined.

» Write for folder explaining fully the Elastic Stop principle

ELASTIC STOP NUT CORPORATION
2351 VAUXHALL ROAD • UNION, NEW JERSEY

WALTHAM *MAGAZINE Fed* **PINION CUTTERS** *with* **INDIVIDUAL MOTOR DRIVE**



INSURE
Great Accuracy Smoothness and Production. . . .

Improved in design, Waltham Pinion Cutters achieve not only great accuracy and smoothness of work but also steps up production.

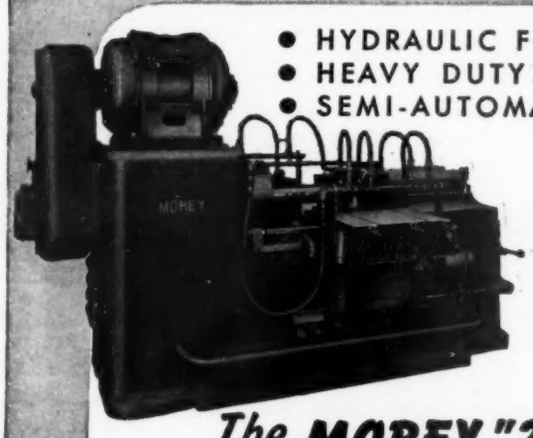
The magazine feed may be omitted and fine pitch gears up to 1½" diameter may be cut in a stack about 1" long.

A countershaft for group drive can be supplied if preferred. Bench space requires 20"x22". Write for further details.

WALTHAM MACHINE WORKS
HIGH STREET WALTHAM, MASS.

Suitable for 105 M.M. to 155 M.M. Shells

- HYDRAULIC FEED
- HEAVY DUTY
- SEMI-AUTOMATIC



The MOREY "27" SHELL LATHE

Timken Tapered Roller Bearings for Main Spindle—All Others Anti-Friction

The HYDRAULIC FEED insures an almost effortless operation. Rigid enough to use carbide tools to their full capacity—entirely self-contained—no outside or auxiliary equipment required! Details in Circular 715—ask for it.

MOREY MACHINERY CO., INC
410 BROOME STREET • NEW YORK, N. Y.

They're BUILT to take a beating...

They are the Fafnir Ball Bearings that the Machinery Makers "bury"! They're big and rugged . . . built to last a lifetime in the *inaccessible spots*. They're the kind of ball bearings that require no pampering . . . and deep in the heart of a giant press, or blooming mill, or whatever . . . they work dependably and efficiently under the most punishing load and operating conditions. They're truly built to take a beating!

Fafnir Heavy Duty Ball Bearings, like all bearings of the complete Fafnir line, incorporate the time-proved Fafnir Balanced Design. This means larger balls and deeper races for greater strength and ruggedness . . . for greater radial and thrust capacity. Your requirements may not demand such brute strength in a ball bearing . . . but you are interested in the performance they typify which is reflected in all Fafnir Ball Bearings. The Fafnir Bearing Co., New Britain, Conn.

The Fafnir Ball Bearing pictured here is the No. 320 Medium Series, with a load capacity of 36,380 lbs. at 50 R.P.M. Designed for use on horizontal shafting to handle heavy radial loads. A corresponding bearing, for vertical shafting to handle heavy thrust loads, is the Fafnir Thrust Ball Bearing No. N1820.

ARMY (E) NAVY

FAFNIR
Ball Bearings

THE BALANCED LINE
FOR ORDNANCE, AIRCRAFT AND
INDUSTRIAL MACHINERY

Once a special *not* always a special

Just when does a "Special" bearing become a "Standard" bearing? The logical answer seems to be . . . "when it solves a problem that is common throughout a particular industry, and when the demand for this *better* bearing is universal and continuous." In this event, the bearing goes into regular production and becomes a "Standard" in the line.

There are many such ball bearings in the Fafnir line . . . the original "Specials" have become standard because they do a job better and more efficiently than it had ever been done before.

The willingness of Fafnir engineers to tackle problems confronting bearing users in every industrial field has resulted in the over-all superiority and broadness of the Fafnir line. Time and time again, the selection of Fafnir Ball Bearings has been the "turning point" to greater machine operating efficiencies . . . savings in power transmission and low-cost, maintenance-free operation. Bearing users searching for outstanding bearing performance on common and unusual applications have ended their quest with Fafnirs. The Fafnir Bearing Company, New Britain, Conn.

Problem: Excessive Dirt and Dust.
Solution: FAFNIR "MECHANI-SEAL" BALL BEARINGS—a 100% efficient labyrinth sealed bearing. Close tolerances rather than rubbing members seal dirt out, lubricant in. No friction or drag.
Problem: Lack of Space
Solution: FAFNIR EXTRA-COMPACT BALL BEARINGS—so compactly built that a shaft 40 m/m in diameter, for instance, needs a housing bore of only 68 m/m instead of the usual 80 m/m! For the machine designer who wants precision bearings with greater load capacities.
Problem: Sloppy or Binding Aircraft Control Pushrods.
Solution: FAFNIR SELF-ALIGNING BALL BEARING UNITS—assure sensitive, rigid, frictionless aircraft control. Now standard equipment on every type of aircraft.
Problem: Installation
Solution: FAFNIR WIDE INNER RING BALL BEARINGS, that you don't have to hammer on and hammer off your shafts. They slip over the shaft and become rigidly engaged by a simple turn of a Locking Collar. Just as easily disengaged.
ARMY E NAVY
FAFNIR
Ball Bearings
THE BALANCED LINE
FOR ORDNANCE, AIRCRAFT AND
INDUSTRIAL MACHINERY

THE BOLT THAT'S GOING TO WAR ...62% FASTER

THIS ACTUAL SHOP REPORT TELLS THE DRAMATIC STORY OF MARATHON C-6 CUTTING AND GRINDING OIL

[redacted] PRECISION THREAD GRINDING SPECIFICATIONS			
CUSTOMER [redacted]		SERIAL #4233	
ADDRESS [redacted]		STYLE #33 External	
PART	Reduction Gear Pinion Bolt	PITCH	24
SIZE RANGE ON P. D.	.2830 - .2849"	FORM	USF
MATERIAL	SAE 3140	GRIND from solid .027"	
HARDNESS Rockwell C Scale	26 - 32	FINISH CUT	None
LENGTH OF THREADS	.50"	TYPE of wheel 180U9TH	
TYPE OF OIL	[redacted]	OHIO OIL 873 MARATHON C-6	
WORK SPEED R. P. M.	20	40	
WHEEL SPEED Ft. P. M.	9,000	9,000	
AMT. DRESSED FROM WHEEL	.00225	.002	
WHEEL DRESSING REQ'D	Once every 10 bolts	Once every 18 bolts	
PRODUCTION	500-600 per 8-hr. shift	900-1000 per 8-hr. shift	

HERE'S WHAT WAS DONE...

Marathon C-6 cutting and grinding oil was substituted for another high-quality grinding oil on the thread grinder producing this bolt.

HERE'S WHAT HAPPENED...

- ★ **Work speed of the machine was *increased* 100%.**
- ★ **Running time between wheel dressing was *increased* 80%.**
- ★ **Production jumped from an average of 69 units per hour to *111 per hour* . . . a 62% increase.**

HERE is an example of the hundreds of spots in which 873 Marathon C-6 cutting and grinding oil is speeding up the flow of guns and ammunition, planes and tanks to the fighting fronts of the world.

Read the actual shop report on the right. That's the kind of performance you want, isn't it? It's the kind you can expect with 873 Marathon C-6 cutting and grinding oil. C-6 is clear, transparent—operators can actually read a scale through it. And it operates at lower working temperatures, too, which means greater accuracy, longer tool life.

Get all the facts by talking to the Ohio Oil Company Lubrication Engineer. He'll recommend cutting and grinding oils that will increase production, cut costs, save time throughout your plant. Phone, write, wire . . . today.

The OHIO OIL COMPANY, Inc.

GENERAL OFFICES: FINDLAY, OHIO

District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

A COMPLETE LINE OF CUTTING AND GRINDING OILS FOR EVERY REQUIREMENT

PRODUCERS OF PETROLEUM SINCE 1887

BUZZER

INDUSTRIAL GAS FURNACES

Faster heating to higher temperatures—without blower or power

2400° in 90 min.
FOR HEAT TREATING

BUZZER "SUPERHEAT" HIGH SPEED FULL MUFFLE FURNACES, primarily designed for high carbon and alloy steels are rugged, effectively insulated and low in gas consumption. They offer protective atmospheres, are flexible in control and quiet in operation.

Made in several standard sizes.

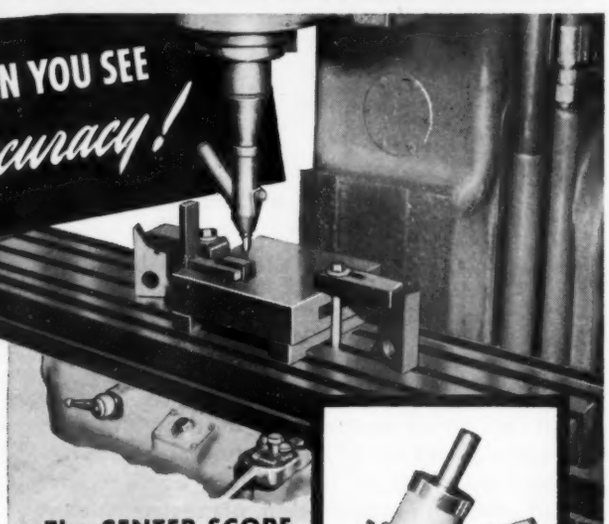
1650° in 75 min.
FOR POT HARDENING AND MELTING

BUZZER ATMOSPHERIC POT FURNACES—for cyanide, salt bath and lead hardening may also be used for melting aluminum and zinc. They are tangentially fired, assure even heating and can be depended on for long life, flexibility, economy and easy control. Several standard sizes are available.

The 32-Page "BUZZER" Catalog covers the complete line of Industrial Gas Furnaces available. Write for your copy.

CHARLES A. HONES INC., 121 So. Grand Ave., Baldwin, N. Y.

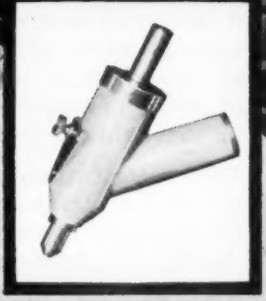
ONLY WITH THE CENTER SCOPE CAN YOU SEE TO GET *Unquestioned Accuracy!*



AND ONLY WITH THE CENTER SCOPE IS ACCURACY SO SIMPLE!

There is no mystery about the Center Scope's accuracy—its magnification (45) enables you to see and to locate "within a tenth" regardless of the tolerances allowed. Thus with tolerances to spare you get *unquestioned accuracy* on every job.

On a vertical mill as illustrated, when measurements of extreme accuracy are needed, high precision boring can be done with the Center Scope and Edge Block without worry regarding lead screws, back lash or table inaccuracies. Lay a stack of size blocks of the right length flat on the work piece. With one end tight against a parallel held flush to the edge of the work—place an Edge Block on the other end and center it to the spindle axis. This method of locating with the Center Scope is fast and practical—it speeds production—eliminates the source of errors—and gives you at all times UNQUESTIONED ACCURACY!



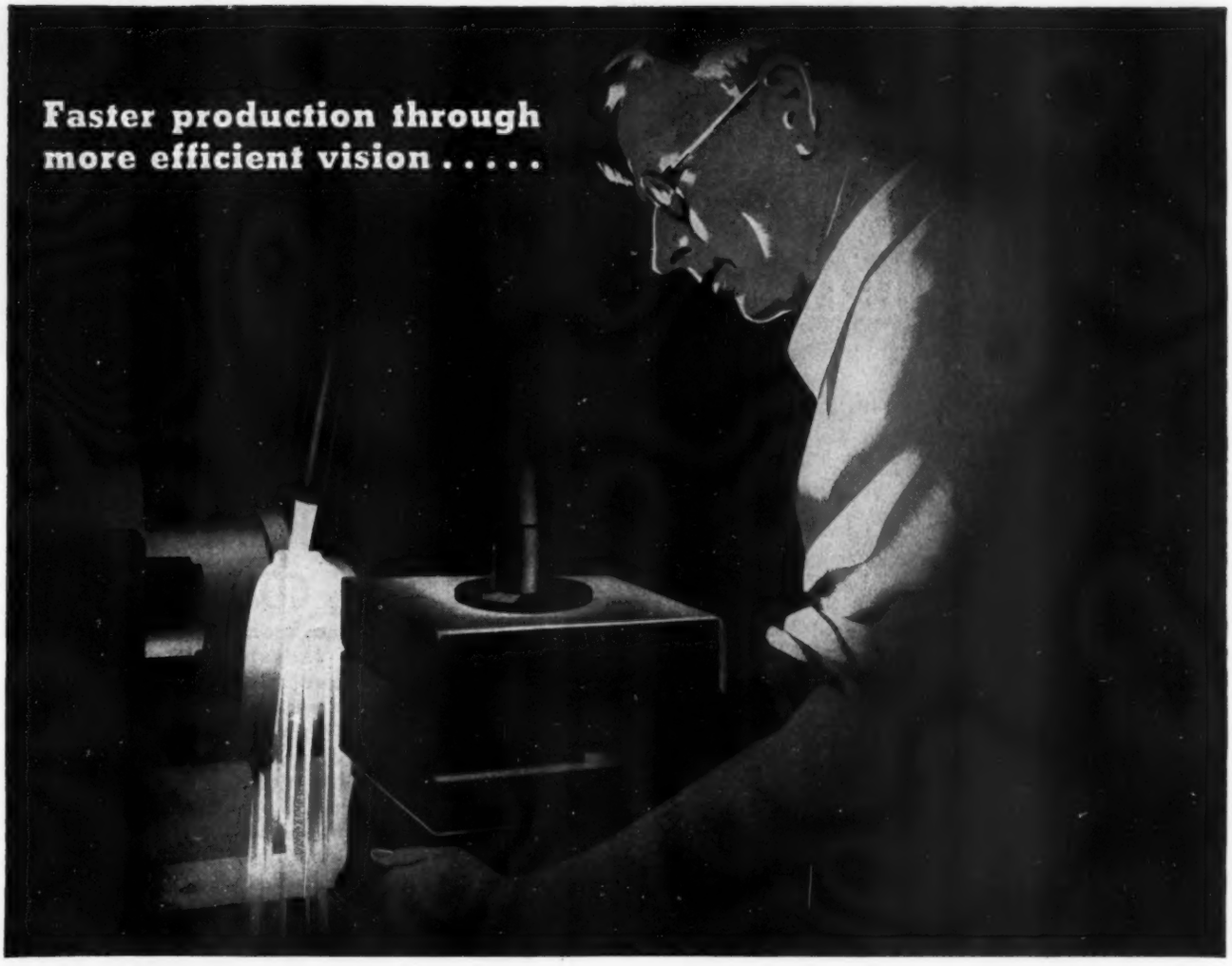
The CENTER SCOPE
—is an optical locating and centering tool that can be used on any machine. It's a rugged shop tool that quickly and accurately compensates for spindle or adaptor run-out, makes old machines more versatile, and easily locates edges to spindle axis.

Used directly "on the job"—the Center Scope is not affected by wear or changes in temperature—nor is it affected by mechanical pressure, *for it never touches the work!*

The Center Scope is the only instrument that enables you to see that you are *unquestionably right!*

CENTER SCOPE INSTRUMENT CO.
351 South La Brea, Los Angeles, Calif.

"AN EYE FOR ACCURACY"



Information supplied by "The American Weekly"— Mr. R. D. Potter, Science Editor

More and more wartime conditions are bringing men over 40 into high-speed or close tolerance industrial work. Many of these have eyes not quite up to the job. Under peacetime conditions this defect is not of vital importance, but today with every nerve strained to increase production, it is serious.

Some industries are giving mass eyesight examinations seeking to find those employees needing glasses or optical corrections in the glasses they now have. Still others take the added precaution of endeavoring to fit the job to the type of eyesight available for it — near-sighted people may be excellent on close work such as bomb sight assemblies, whereas far-sighted people would be better suited to work on a large lathe where micrometer readings must be made at distances as great as 30 inches. Following this thought further some companies have employed special occupational eye glasses ground to fit the working conditions of the employee.

Efficient eyesight is the backbone of fast, accurate production. It will pay Industry to further it by every means possible.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Mo-ly-b-den-um Company
500 Fifth Avenue • New York City

MOLY

Protect Dead Centers with DIXON'S LATHE CENTER GRAPHITE LUBRICANT

HERE, AT LAST, is a lubricant compounded especially to protect the dead centers of lathes. It is a combination of pure flake graphite and ingredients made to withstand the extremely high pressures developed at the dead center in lathe work.

Dixon's Lathe Center Lubricant prevents overheating and assures effective protection against wearing, scoring and softening. Eliminates shut-downs and reduces work spoilage.

Use Dixon's Lathe Center Lubricant in other applications wherever extreme film-strength is required. Now obtainable from distributors in 1, 4 and 8 ounce collapsible tubes.

JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J.
I am interested in trying DIXON'S LATHE CENTER GRAPHITE LUBRICANT.
My Supply Houses are:

.....

.....

Name.....

Address.....4

JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J.

Ticonderoga Graphite • No. 635 Graphite • Microfyne Graphite • Pipe Joint Compound • Graphite Seal • Graphited Oils • Cup and Pressure Gun Grease • Gear Lubricants • Waterproof Graphited Grease • Auto-Marine Grease • Graph-Air Guns • Belt Dressing (Contains no Graphite).

3233

HOW TO Cut Corners for PRODUCTION SPEED-UP with

TURCO

SPECIALIZED Industrial Chemical COMPOUNDS

Turco Products, Inc., manufactures more than 225 Specialized Industrial Chemical Compounds which have been designed for production speed-up on almost every operation in the plant. In preparation for anodizing or chromatizing; for phosphatizing; for spot welding and weld masking; for degreasing and decarbonizing of machine parts and all of the operations listed on the coupon below, there is a thoroughly tested Turco material. Ask us for technical information. Call on your local Turco Field Service Engineer for free consultation. For ideas and production short cuts, check and mail coupon below. No obligation.

MAIL THIS COUPON

TURCO PRODUCTS, INC.
6135 S. Central Ave., Los Angeles 1-122

Please send FREE literature on materials, methods and procedure pertaining to the operations checked below:

NAME_____TITLE_____

FIRM_____

ADDRESS_____STATE_____

I'M INTERESTED IN THE OPERATIONS WHICH I HAVE CHECKED (✓):

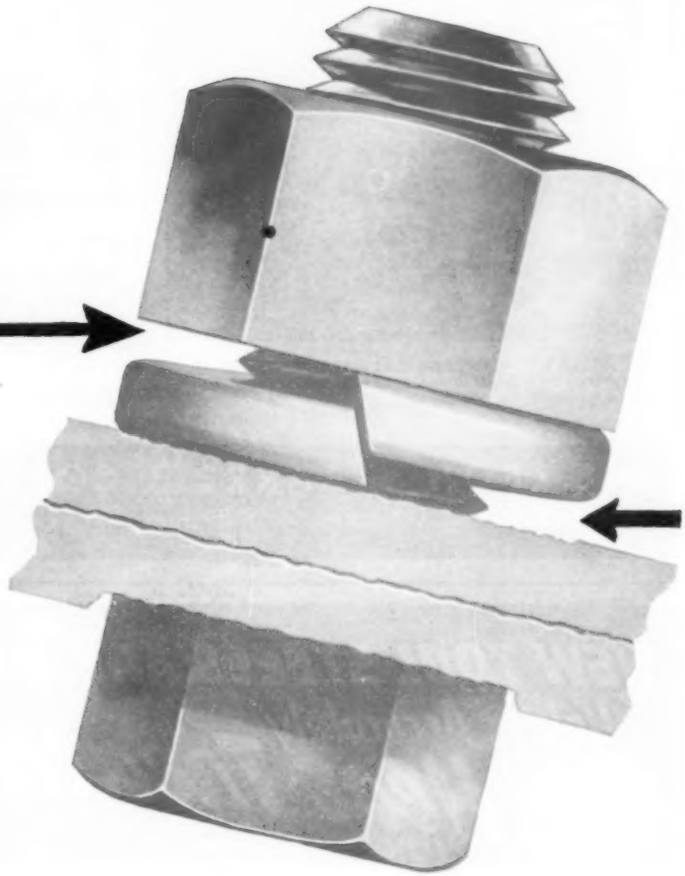
- ☐ Acid Pickling
- ☐ Aluminum Spot Welding
- ☐ Anodizing
- ☐ Cadmium Plating
- ☐ Chemical Vapor Cleaning
- ☐ Chromatizing
- ☐ Cleaning Metals Before Processing
- ☐ Cleaning Prior to Plating
- ☐ Cold Immersion Cleaning
- ☐ Cold Spray Cleaning
- ☐ Floor Maintenance
- ☐ Glass Cleaning
- ☐ General Plant Maintenance
- ☐ Hot Immersion Cleaning
- ☐ Magnesium Processing
- ☐ Paint Camouflage Cleaning
- ☐ Paint Department Maintenance
- ☐ Paint Stripping
- ☐ Phosphatizing
- ☐ Scale Removal and Control
- ☐ Stainless Steel Processing
- ☐ Steam Boiler Maintenance

TURCO PRODUCTS, INC.
LOS ANGELES • SAN FRANCISCO • CHICAGO
HEAD OFFICE: 6135 So. Central Ave., Los Angeles
Sales and Service Representatives and Warehouse Stocks in All Principal Cities

Factories in Los Angeles and Chicago

A little spring can't go a long way

So when you order spring washers specify the ones with long range of spring power



INSIST ON KANTLINKS—the big long-range spring washers that expand and compensate for inevitable wear of bolted parts. . . . There is no substitute as economical on any assembly that is subjected to vibration. Short-range multi-toothed washers that bite in can not give you the wide expansion range of Kantlinks' **spring power.**

Furthermore, Kantlinks should be used with **every** type of nut, whether a regular standard nut or any one of the many fixed or locked nuts. For even if the nut never budges on the bolt, all other parts of almost every bolted assembly loosen sooner or later **unless** an adequate size helical **spring** washer is used to hold every part tight.

The parts will loosen because of bolt stretch, and frictional wear of metal on metal, burrs and flares, and because of pulverizing of paint, scale, and rust.

This is war time—be safer with powerful Kantlinks.

Let us send you samples—send details of your application. Test and compare them on the same job with **any** type of nut, or with any other type of washer. Kantlinks can't lose a real test. Try them for efficiency, economy and real safety.

Write today for descriptive folder.

THE NATIONAL LOCK WASHER COMPANY
NEWARK, N. J., U. S. A.

KANTLINK
TRADE MARK

the long-range Spring Washer

A Quick, Smooth, Uniform coating — assured by
BARRETT GALVANIZING AND HOT TINNING CENTRIFUGALS

BARRETT CENTRIFUGAL GALVANIZER is driven with high torque head and has an equalized disc brake for quick stop.

With these new Barrett machines for expelling excess metal from small parts after dipping in molten metal, faster and better work is assured which will pass the most rigid inspection for quality.

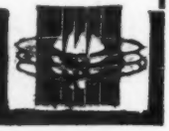
The method of handling work is simple and easy. Work to be processed is placed in a basket and submerged in a kettle of hot molten metal. When thoroughly heated, the basket with the work is transferred into the Barrett Centrifugal where the basket is revolved and the excess metal thrown from the work. A quick pick up and stop (from 2 to 3 seconds each) assures fast work. Then too, quick pick up snaps the excess metal from the work before centrifugal action comes into play. With Barrett Equipment excess molten metal can be quickly thrown off before the metal cools, thereby assuring smooth, even thickness of coating.

Barrett Centrifugals for Galvanizing with and without heated drums are available in capacities from 40 to 240 loads per hour handling from 5 to 100 lb. loads. For tinning, Barrett offers the #0 Centrifugal Machine, operated similarly to the Galvanizers. On threaded work, tinning is so exactly done that rethreading is unnecessary.

Barrett Galvanizers, combining convenience of operation with the utmost in speed and safety are developed to meet the requirements of actual use by men thoroughly familiar with this class of work. They are self-contained and occupy the minimum of floor space.

Send at once for full details of Barrett Centrifugal Galvanizer

THE LEON J. BARRETT CO., WORCESTER, MASS.
Designers and Builders of Centrifugal Machinery



NEW TOOL STEELS ARE Tricky Unless Accurately Heat Treated

***Use* DESPATCH *Furnaces for —* { TOOLS . . . DIES . . . PRECISION PARTS**

Pot type recirculating furnace. Working sizes 8" x 12" to 60" x 60".

"TRICKY" is just the right word for some of the new NE steels for tools and dies . . . unless you have a furnace capable of speedy, accurate heat treatment.

DESPATCH furnaces are excellent for this purpose. Their built-for-the-job construction features assure constant dependability and excellent results.

UNIFORM heat guaranteed in chamber regardless of size of load.

ACCURATE temperature control throughout heat range 275° F. to 1250° F.

SPEEDY transfer and distribution of convection heat increases efficiency, aids production.

ADAPTABLE to many processes. Prompt response to new control settings. Wide utility.

WRITE TODAY for Bulletin 81-J, pot furnaces; or Bulletin 83-J, batch furnaces.

Batch type Despatch furnace, gas or elec. Sizes: 13" x 13" x 13" to 37" x 25" x 37".

DESPATCH OVEN COMPANY
MINNEAPOLIS MINNESOTA

Call Scully

for NATIONAL EMERGENCY ALLOY STEELS

These new alloy steels were developed as substitutes for the old style alloy steels to save critical materials such as nickel and chromium. They cover a wide range of properties and were especially designed to meet present conditions. In fact, many "NE" steels are actually outperforming the steels previously used.

We have "National Emergency Alloy Steels" in stock. We welcome your inquiries and will gladly assist you in determining the grades best suited to your needs.

Telephone, write or wire the Scully Warehouse nearest you.

for GENERAL PURPOSE STEELS

Steel products, tools, machinery and equipment

Like yours, our first job is to do everything possible to speed war production. So, if you lack steel to finish a war job, or if your production is in danger of being slowed down for want of some piece of steel—call the nearest Scully Warehouse. Many such calls have kept wheels turning.

Although our stocks are not what we wish they were, what we have can be yours—in a hurry—subject, of course, to priority restrictions.

If we don't have what you need, we'll do everything we can to help you find a source of supply. So try Scully—note our phone and teletype numbers below, at the left.

for AIRPLANE MATERIALS

Our Chicago Warehouse has been designated by the War Production Board as a warehouse to distribute the following aircraft products:

WD-X-4130 Sheets, *Open Hearth, Normalized, Pickled and Oiled to Spec. AN-QQ-S-685, Condition N. All gauges .020 to .375 sheets 18 x 72".*

Stainless Steel Rounds, *Spec. AN-QQ-S-771. Composition "FM", Physical Condition "A". Surface condition, centerless ground.*

Stainless Sheets—*Spec. AN-QQ-S-772, Composition "G" Physical Condition "A", Surface Condition No. 1.*

These materials are for use in airplanes only and available only to the aircraft industry and sub-contractors. They are in stock in our Chicago Warehouse. If you are eligible for these materials, phone, write or wire: Scully Steel Products Company, 1319 Wabansia Avenue, Chicago, Ill. Telephone, BRUnswick 2000 —Teletype CG. 605.

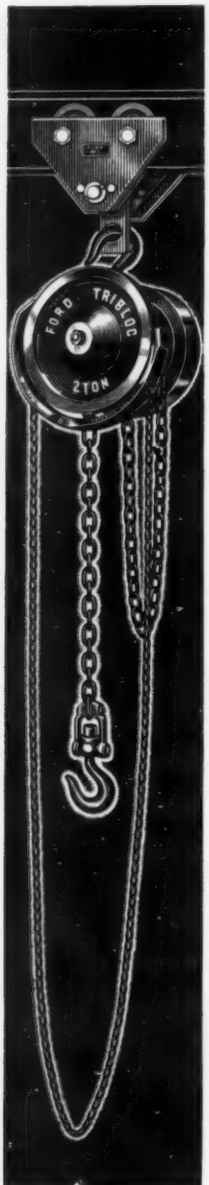
SCULLY STEEL PRODUCTS COMPANY

CHICAGO	BRUnswick 2000
Teletype CG. 605	
BALTIMORE	GIlmore 3100
Teletype BA. 63	
BOSTON	STAdium 9400
CLEVELAND	HEnderson 5750
Teletype CV. 153	
PITTSBURGH	CEdar 7780
Teletype PG. 475	
ST. LOUIS	MAin 5235
MINNEAPOLIS-ST. PAUL	NEstor 2821
NEWARK, N.J.	Bigelow 3-5920
BErgen 3-1614 -	REctor 2-6560

USS Scully Service

UNITED STATES STEEL

Keep those FORD Tribloc PRIMED FOR UNCLE SAM!



Here's How!—

FORD TRIBLOCS withstand abuse amazingly well—but this is certainly no time to abuse *anything* made of critical materials. Like any other precision-made machine **FORD HOISTS** will give more efficient service for a longer time if properly maintained. In **FORD HOIST** maintenance, lubrication is perhaps the most important single factor—so here are a few pointers on lubricating **FORD TRIBLOCS.**

- **The gear cover should be removed occasionally and a small quantity of heavy graphite grease added.**
- **The load chain should be lubricated frequently with a heavy oil, particularly at engaging points of links.**
- **Load sheaves should also be well greased.**
- **Oil the bearings frequently so that no bearing will run dry and cause excessive wear.**
- **Five oil holes are provided in the TRIBLOC and these should be filled frequently.**

When given intelligent care, thoroughly lubricated and cleaned at intervals, **FORD TRIBLOCS** will remain efficient under the hardest usage for a long time. Your **FORD HOIST** can be one of your best friends during this production emergency. Take care of it.

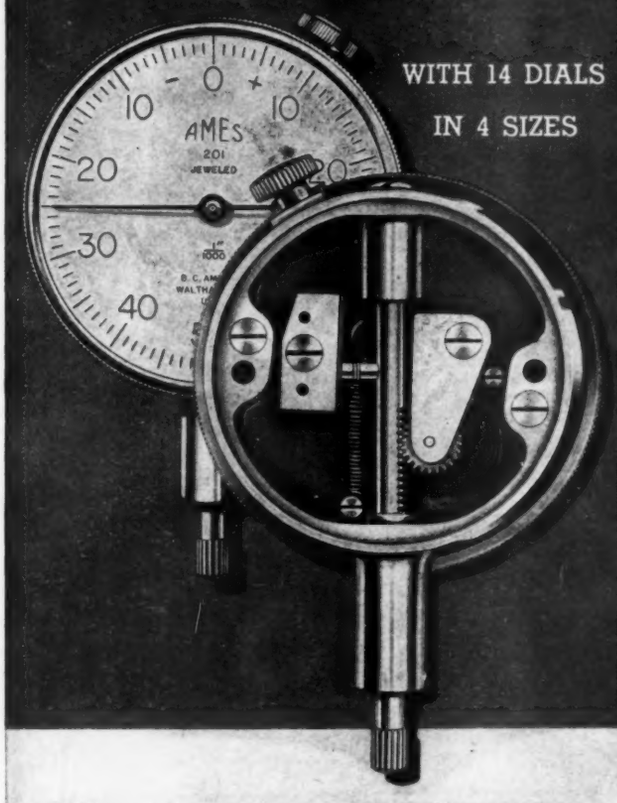
Order from your distributor

FORD CHAIN BLOCK DIVISION
PHILADELPHIA • CHICAGO
SAN FRANCISCO

In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

AMEs Hundred Series DIAL INDICATORS



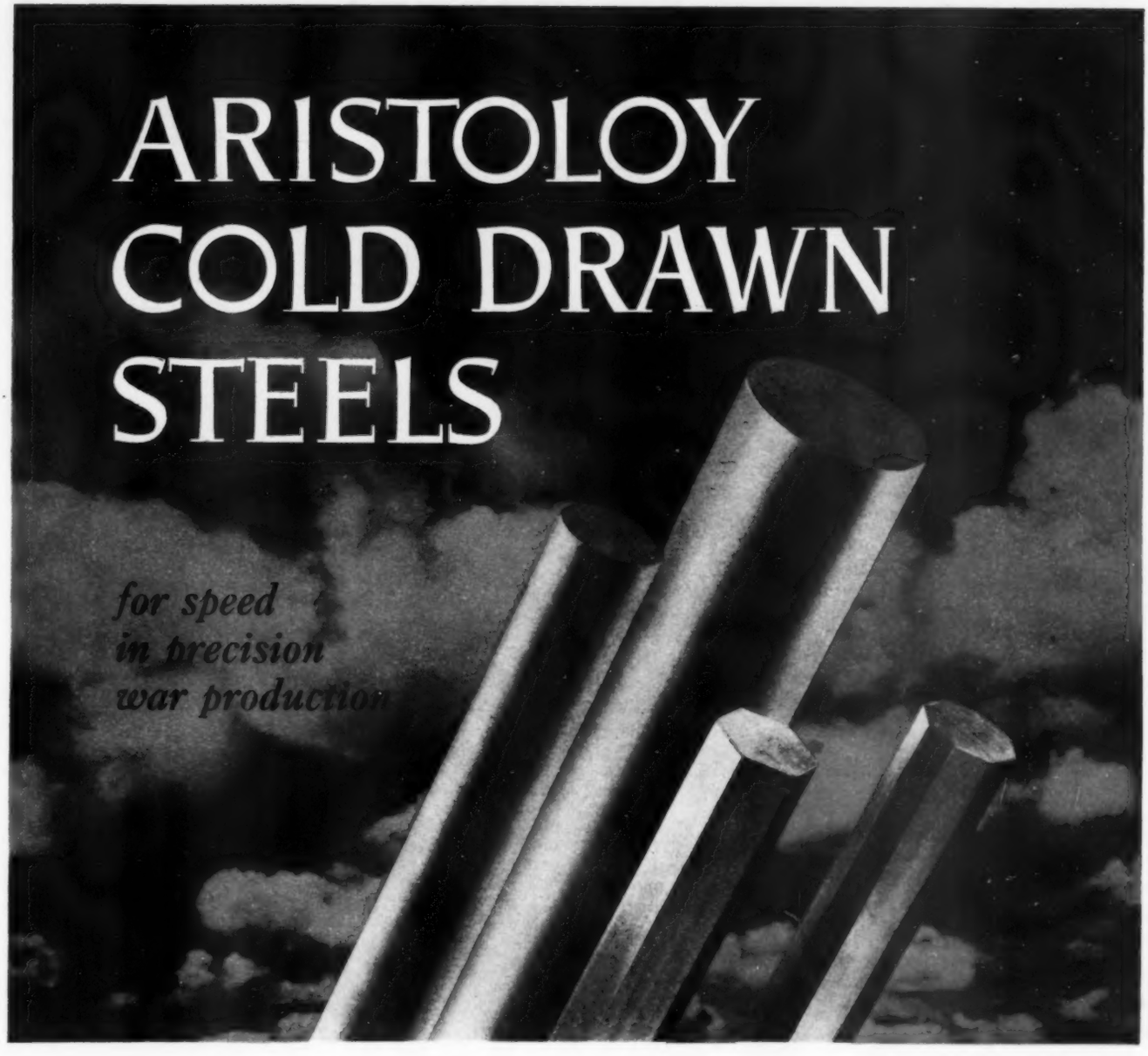
WITH 14 DIALS
IN 4 SIZES

A COMPLETE NEW SERIES

These Dial Indicators have all the desirable features for measuring and checking accuracy. Four sizes to American Gage Design Committee specifications. Fourteen different dial numberings. One-piece, drop-forged cases and stems. Wire attached bezels. Cup-shaped dials that need no springs beneath. Pinions and staffs of hardened steel, ground for accurate fitting and long wear. Various styles of backs and contact points. The best and most effective shock-absorbing wheel assembly, optional.

SEND FOR CATALOG NO. 52

B. C. AMES CO.
WALTHAM, MASS.



Cold Drawn Steels have the vital wartime job of keeping fast automatic production machines operating continuously at peak loads. The uniform surface and close tolerance of Aristoloy Cold Drawn Steels assure smooth machining with longer tool life and uninterrupted production.

COPPERWELD STEEL COMPANY
WARREN, OHIO

ARISTOLOY STEELS

TO BUILD MORE • • • BETTER • • • FASTER

Carbon Tool Steels • Aircraft Quality Steels • Nitralloy Steels • Alloy Tool Steels • Stainless Steels • Bearing Quality Steels • Cold Drawn Steels

GIVING 'EM *More* TO WORK WITH!

CAPACITIES: 250, 500, 1,000 and 2,000 pounds

Awarded the Navy "E" for excellence in war production, P&H displays it also as a pledge of future effort.

Getting more "working tools" to battle-fronts — faster — that's the job for P&H Zip-Lifts in war plants today. These handy little electric hoists are speeding up materials handling along production lines—in store rooms — on loading platforms, etc. They're supplementing man-power and relieving worker fatigue so that both men and machines can produce more.

With bolt, hook, or trolley mounting — the P&H Zip-Lift is ready to go to work in a hurry, *anywhere*. Just hang it up and plug into any standard lighting circuit. Full magnetic push-button control makes it safer, easier to operate. It's the quality hoist in the low price field. Literature on request.

General Offices: 4514 West National Avenue, Milwaukee, Wisconsin

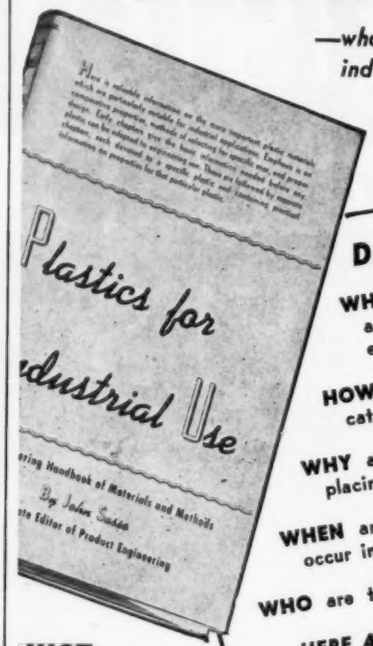
HARNISCHFEGER CORPORATION

HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

TESTED PLASTIC APPLICATIONS

—what plastics are best for industrial use

—how to use them



Do you know . .

WHAT are the advantages and disadvantages of each plastic?

HOW are the plastics fabricated?

WHY are they permanently replacing other materials?

WHEN are troubles most likely to occur in molding?

WHO are the suppliers and molders?

HERE ARE YOUR ANSWERS:

JUST OUT!

Here in this book is valuable information on the more important plastic materials which are particularly suitable for industrial applications. Emphasis is on comparative properties, methods of selecting for specific uses, and proper design. Gives basic information needed before any plastic can be adapted to engineering use and provides specific data on characteristics and suitability of the various types on the market at present.

PLASTICS FOR INDUSTRIAL USE

By John Sasso, Associate Editor of *PRODUCT ENGINEERING*
229 pages, 6x9, 96 illustrations, 44 tables, $2.50

This comprehensive book gives all who are interested in the designing of industrial products, a clear, detailed picture that will enable them to evaluate plastic materials in relation to the particular design problems at hand. For convenience it classifies plastics on the basis of their origin and whether they are thermosetting or thermoplastic. Many examples of plastic designs are illustrated, as well as described. All data have been taken from reliable sources and have been doubly checked by many experts.

PRACTICAL FEATURES

- up-to-the-minute information on new plastics such as Ethyl Cellulose and Saran, announced only recently
- extensive factual data on transparent plastics, with much direct information on the use of this plastic in aircraft
- helpful pointers and facts on faults, causes, and their remedies, in molded parts
- explicit information on material properties—electric, thermal, etc.
- an extensive directory of trade names, suppliers, and molders is provided

SEE IT 10 DAYS FREE

McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York, N. Y.

Send me Sasso's Plastics for Industrial Use, for 10 days' examination on approval. In 10 days I will send you $2.50 plus few cents postage or return book postpaid. (We pay postage on cash orders.)

Name .....

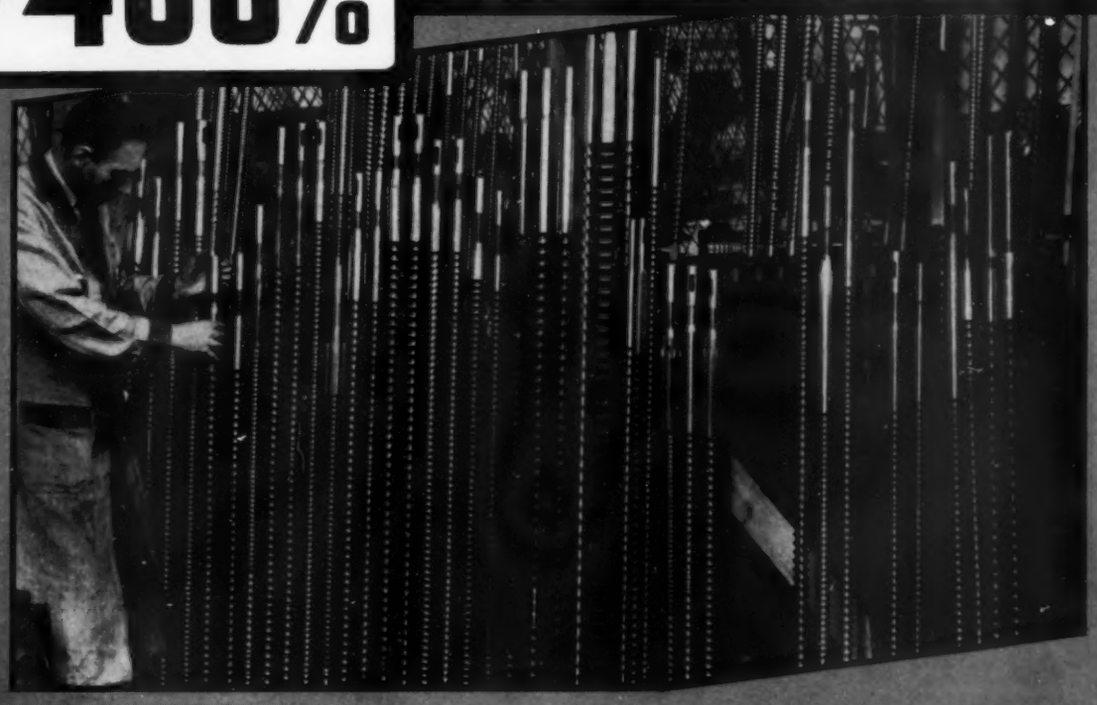
Address .....

City and State .....

Position .....

Company .....A. 12-10-42

400% LONGER BROACH LIFE BETWEEN GRINDING!



That's the kind of performance manufacturing industries are getting with

EN-AR-CO PROMAX CUTTING OILS

● For over sixty years The National Refining Company has pioneered in the development of industrial Lubricants. Our engineers are at your service to help you solve your lubrication problems.

● *In spline broaching on S.A.E. 6120 steel, the broach life between grinds was 500 pieces. Broach life was increased to 2500 pieces between grinds when using En-Ar-Co PROMAX Cutting Oil.* ● This is only *one* of the many reports covering a wide range of operations and proving that PROMAX Cutting and Soluble Oils permit higher speeds . . . heavier cuts . . . better finishes . . . with greater production between grinds.

Write today about the type of PROMAX Cutting Oil best adapted to your production needs.

EN-AR-CO INDUSTRIAL LUBRICANTS

THE NATIONAL REFINING COMPANY

Cleveland • Indianapolis • Chicago • Peoria • Omaha • Kansas City • Memphis

East of Ohio . . . The Globe Refining Company, Cleveland, Ohio

DREMEL MOTO-TOOLS SPEED UP WAR PRODUCTION

Dremel Moto-Tools are speeding up war production in defense plants from coast to coast. These rugged tools tackle grinding, routing, buffing and finishing jobs with speed and precision . . . faster and easier, in close quarters . . . in hard-to-get-at places.

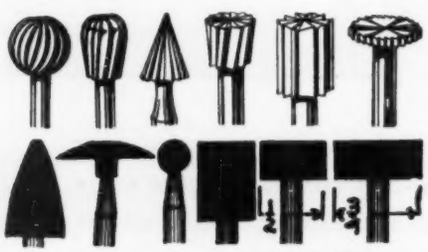
A Dremel Moto-Tool has a shock-proof bakelite housing, oil-sealed bearings, and a balanced armature to eliminate vibration and produce finer finished surfaces. It weighs only 13 ounces . . . can be hooked up to any AC or DC outlet. Used in America's leading arsenals of democracy . . . by General Electric, Westinghouse, Remington Arms, Ford, Nash-Kelvinator, Consolidated Aircraft, Douglas Aircraft, Northrop Aircraft, and many others.

Below: Tool makers find Moto-Tool's sensitive, finger-tip control indispensable when shaping intricate or irregular metal dies. For grinding or cutting with steel accessories . . . it can't be beat for convenience.

Above: Moto-Tool is ideal for getting into close quarters, grinding, buffing and finishing to required specifications. For metal, wood, plastics, porcelain, glass, and other materials.

27,000 R.P.M.

This complete Moto-Tool kit has accessories for all types of grinding, buffing and finishing operations . . . with steel cutting tools and the best abrasives. Consists of 1 Model 2 Moto-Tool with three collets:— 1/8", 3/32", and 1/16", 4 Emery Wheel Points, 1 Dressing Stone, 8 Carving Cutters, 1 Steel Saw, 3 Bristle Brushes, 1 Steel Cleaning Brush, 1 Screw Mandrel with Sanding Discs, and 1 Shoulder Mandrel, one 1/2" Drum Sander. Packed complete in sturdy felt-lined hardwood cabinet case . . . $23.50. Dremel No. 2 Moto-Tool, $16.50.



Dremel emery wheel points, steel cutters and accessories with 1/8" shanks are available for quick delivery in a wide variety of sizes and shapes. They can be used with practically all makes of hand grinding tools. Write for catalog.

10-DAY TRIAL

Try a Dremel Moto-Tool for 10 days in your own shop. See how versatile, how indispensable it can become to fast, accurate work. Order from your industrial distributor, or contact any of the following representatives:

WEST COAST
The Federated Sales Co.
2437 West Valley Blvd.
Alhambra, Calif.

PACIFIC NORTHWEST
Mac S. Sprincin
2407 First Ave.
Seattle, Wash.

METROPOLITAN NEW YORK
Mill Factor Products Co.
53 West Broadway
New York, N. Y.

NEW ENGLAND
F. V. Fowler
116 Dartmouth St.
West Newton, Mass.

DREMEL MFG. CO., Dept. T472-H, Racine, Wis.

Day and night, 3-mile-a-minute AIR EXPRESS is saving precious time here on the home front flying vital war supplies, to help keep the wheels of production turning at highest speed.

You do not need a priority to ship by AIR EXPRESS, but if you have war production shipments requiring priorities, they will be granted. Phone Railway Express Agency, AIR EXPRESS DIVISION, or any air line.

NOW IN ITS 16th YEAR

AIR EXPRESS

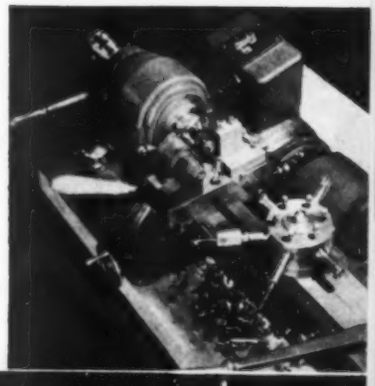
Division of RAILWAY EXPRESS

"Stark"

Integral Drive

PRECISION BENCH LATHE

A new stream-liner incorporating all the old Stark accuracy and stamina



THE first tool of its class with built-in Motor and speed changing mechanism (patented). Marvelously compact: nothing under the bench, no special bench or cabinet needed, even bolting down unnecessary:

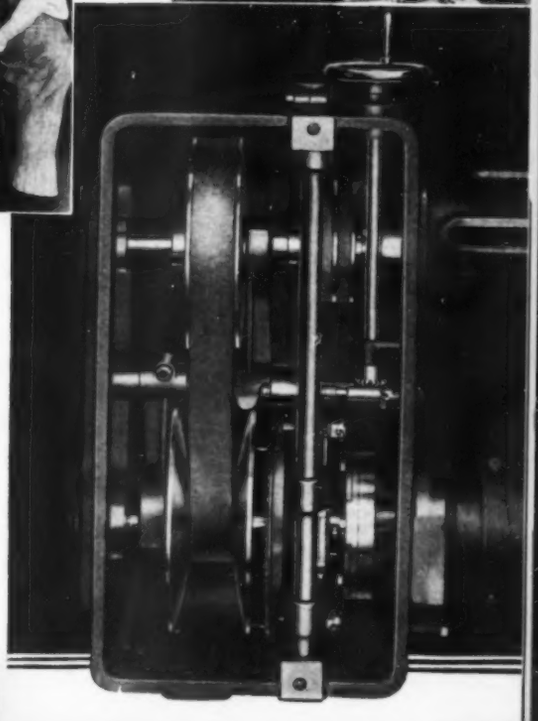
Simply moving control lever to right engages the clutch, vertical position releases, moving to the left instantly brakes the moving spindle.

Standard (tool room) model has time-tried double taper spindle bearings 156 to 2200 r.p.m.—the best for sustained accuracy.

High Speed (manufacturing) Model fitted with best precision pre-loaded anti-friction bearings, 260 to 3500 r.p.m.

Both have 40 inch bed, 9 inch swing, 20 inches between centers, either ¾ or 1 inch collet capacity. Take regular STARK Attachments collets and chucks.

This Stark (patented) built-in drive, integral with the Lathe itself, employs a ½ h.p. geared ball-bearing motor driving through a disc clutch, and through V belts to the headstock, giving any split speed at the turn of the small hand wheel in front of operator.



Write for full information

STARK TOOL COMPANY

WALTHAM, MASS., U. S. A.

ESTABLISHED 1862

ORIGINATORS OF THE AMERICAN BENCH LATHE

The Aviation Industry needs Seed Money

THIS Victory crop is sweet—10,000 planes per month next year seem certain . . . 5,000 per month already passed . . . Worldwide average of four enemy planes knocked down for every American plane lost . . . Jap average five to one . . . Still better planes coming off the line.

And beyond the war, some people see a vast new industrial field opening up for America:

▶ Giant freight and passenger airliners, flying the airocean to every part of the globe, linking our cities in a traffic network that will obliterate time.

Family planes that will jump golfers to far off greens.

What are the chances for this exciting post-war crop of commerce and convenient travel from our aviation industry?

We think the chances are rather slim, and we ask you to take a serious look at the reason.

In our proper anxiety to prevent inflation and control war profits, we have passed tax laws that are taking away most of the "seed money" that aviation companies will need when the time comes to go it on their own in the post-war world.

▶ "Seed money" is that part of profit which is held for re-investment in a business to insure its growth.

"Seed money" will pay for research on new and better products. It will pay for retooling when post-war models are produced. It will pay for the study of methods to get the lower costs that widen markets. It will pay for setting up new distributors and dealers, and for hundreds of other activities that are involved in the *growth* of a business.

▶ American industry has grown on "seed money." It has been a national characteristic to re-invest most of our profits in development.

A dangerous confusion between personal profit (salaries and dividends) and re-invested profit (which we have called "seed money") has found its way into our taxing system.

The tax law, and government contracts, should allow American Industry to accumulate funds for the numerous tasks of post-war development.

A sum greater than the total now remaining after taxes will be needed, if we are to take advantage of the new opportunities that will exist after the war.

It is probably the oldest law in economics that enough of each crop must be saved to provide seed for future crops.

Ask your Congressman to see that this economic law is not disregarded in an effort to take excess profits out of war.

Reprints of this advertisement are available in handy booklet form.

McGRAW-HILL PUBLISHING COMPANY, Inc.

330 WEST 42ND STREET • • NEW YORK

Did you ever try to defend a PROFIT?

EVERY business man knows the difference between profit that is paid out to individuals and profit that is held for re-investment and future growth.

The trouble is that the public thinks of profit in terms of yachts, elaborate homes and costly debutante parties. They have learned to think that way because those things get the headlines.

The public does not know that far more profit money has gone back into American business than has ever been taken out for personal spending.

The McGraw-Hill Publishing Company is going to do its share in the job of explaining the difference between these two kinds of profit.

To be sure that the public does not confuse two different things that have always been called by the same name, we have developed the term "Seed Money."

"Seed Money" is explained in the McGraw-Hill newspaper advertisement reprinted on the opposite page. We urge you to read this advertisement carefully and apply its message.

There will be other McGraw-Hill advertisements on this vital industrial need. We hope, too, that other advertisers will adopt the term "Seed Money" and help by selling their employees in their own communities on the danger to living standards in taking away industry's ability to improve its plants and techniques.

* * *

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

23 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents... More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

THE McGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

McGRAW-HILL PUBLISHING COMPANY, Inc.
330 WEST 42nd STREET • NEW YORK

Aviation—*(AMERICA'S OLDEST AERONAUTICAL MAGAZINE)—INFORMATION HEADQUARTERS FOR THE MEN WHO DESIGN, PRODUCE, OPERATE AND MAINTAIN AMERICA'S AIR SUPREMACY.*

American Machinist
Bus Transportation
Business Week
Coal Age
Chemical & Metallurgical Engineering
Construction Methods
Electrical Contracting
Electrical Merchandising
Electrical West
Electrical World
Electronics
Engineering & Mining Journal
E. & M. J. Metal and Mineral Markets
Engineering News-Record
Food Industries
Factory Management and Maintenance
Mill Supplies
Power
Product Engineering
Textile World
Transit Journal
Wholesaler's Salesman

AFFILIATED WITH BUSINESS PUBLISHERS INTERNATIONAL CORPORATION, PUBLISHERS OF BUSINESS AND TECHNICAL MAGAZINES FOR LATIN AMERICA, AND OVERSEAS CIRCULATION.

FAIRFIELD

For FINE GEARS

• *The modern Fairfield plant at Lafayette, Indiana, houses some of the finest gear production facilities in existence.*

GEARS made to order — large and small, special and standard — spiral bevel, straight bevel, herringbone, hypoid, spur, helical, worms and worm gears, differentials—all made to the highest standards of quality and accuracy. Fairfield is working 24 hours a day, 7 days a week, producing gears for many of America's largest war equipment producers. Remember the name FAIRFIELD, for Fine Gears!

FAIRFIELD

MANUFACTURING COMPANY

307 S. Earl Avenue • Lafayette, Indiana

Typical Products for Which Fairfield Furnishes Gears

TRACTORS • TRUCKS • OUTBOARD MOTORS • ROAD GRADERS
DIESEL ENGINES • MACHINE TOOLS • COMBINE HARVESTERS
POWER SHOVELS • WINCHES • MILITARY EQUIPMENT

Gear Specialties

SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

Gear Specialties
MANUFACTURERS
CHICAGO

2600 W. Medill Av. **Ph. Hum. 3482**

GEAR CUTTING MACHINES

New Design
New Features
New Advantages

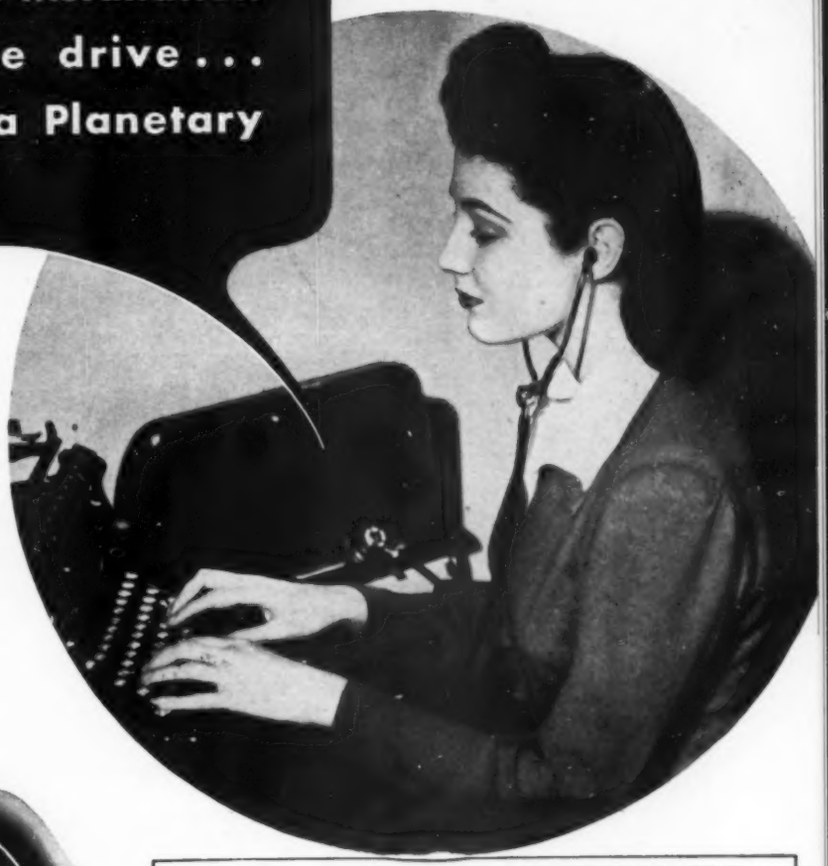
NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK, NEW JERSEY

GANSCHOW GEARS

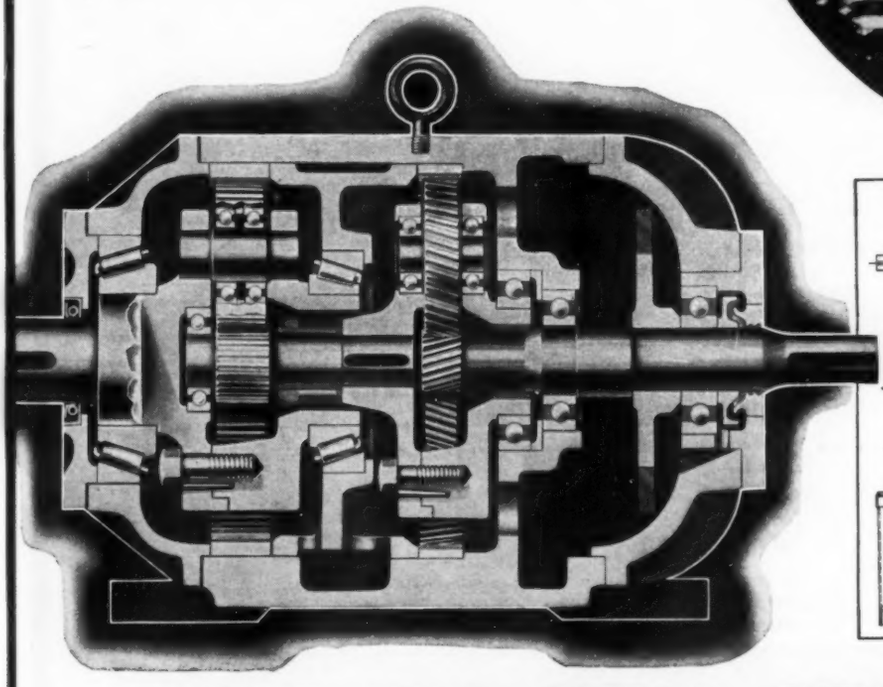
FOR SIXTY YEARS
Spur – SPEED REDUCERS – Worm
ALL TYPES OF CUT GEARS
GANSCHOW GEAR CO., 18 N. Morgan St., Chicago

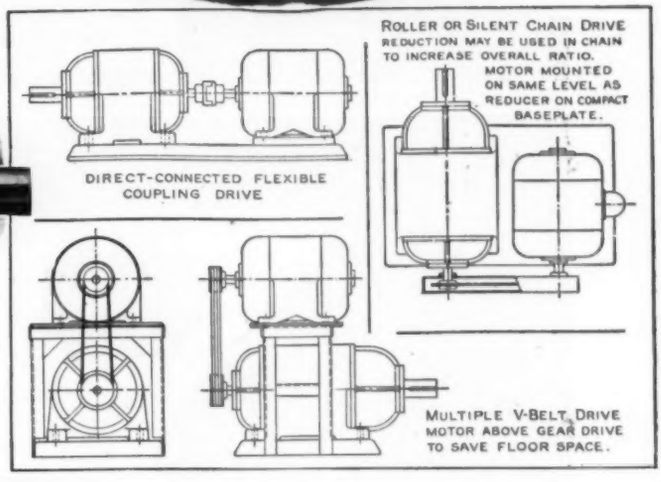
BRAWNY **GEARS**
PROMPT
ECONOMICAL SERVICE
ALL TYPES, MATERIALS AND QUANTITIES
Ask for Estimate
BRAUN GEAR CO., 1590-1608 Atlantic Ave., Brooklyn, N. Y.

. . and where the machine installation suggests a straight line drive . . . you want a Philadelphia Planetary Speed Reducer . . .



The Philadelphia Planetary Speed Reducer was designed to provide a straight line drive superior to the old spur gear type. In these units have been included many of the construction features, parts and precision manufacture that have made the Philadelphia MotoReduceR (the built-in drive) so widely preferred. These Planetary Units will give equal top-notch performance in those applications where a separate drive is desirable. They are compact yet rugged with a well balanced design. The accompanying sketches suggest several ways of mounting. Single, compound and double reduction types fit a wide range of requirements. For details send for catalog 100.

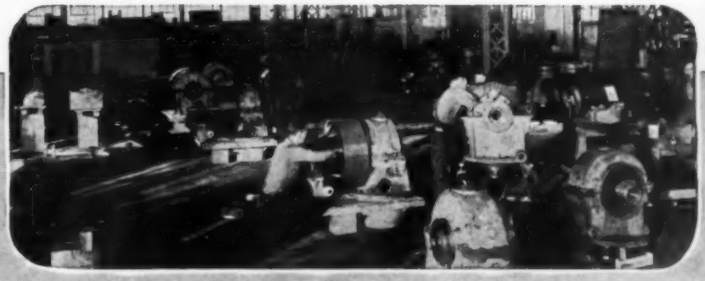



ROLLER OR SILENT CHAIN DRIVE
REDUCTION MAY BE USED IN CHAIN TO INCREASE OVERALL RATIO.
MOTOR MOUNTED ON SAME LEVEL AS REDUCER ON COMPACT BASEPLATE.
DIRECT-CONNECTED FLEXIBLE COUPLING DRIVE
MULTIPLE V-BELT DRIVE MOTOR ABOVE GEAR DRIVE TO SAVE FLOOR SPACE.

PHILADELPHIA GEAR WORKS

INDUSTRIAL GEARS
AND SPEED REDUCERS
LIMITORQUE VALVE CONTROLS

ERIE AVENUE & G STREET
PHILADELPHIA, PA.
New York, Pittsburgh, Chicago



Philadelphia
LIMITORQUE CONTROL
operates all types of valves, etc., safely, economically, from convenient stations.

Philadelphia
WORM GEAR SPEED REDUCER
right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

Philadelphia
MOTOREDUCER
The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

Philadelphia
HERRINGBONE SPEED REDUCER
for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

Philadelphia
GEARS
All types and sizes of industrial gears. Can be supplied in all materials.

Good Tools — Good Gears — Good Service on War Needs

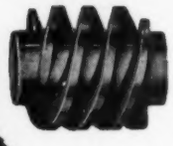
The SIER-BATH *Toolroom reflects High Quality Workmanship*

"Show me the toolroom and I'll tell you what the product is like."

One look into the Sier-Bath toolroom and it's unnecessary to go through the other departments of this new, modern plant, busy on war production, to know that Sier-Bath Gears are high quality precision products. Conveniently arranged, well lighted, and equipped with the latest machines for tool maintenance and inspection, this toolroom reflects Sier-Bath's long experience in the manufacture of accurate, sturdy, long-lived gears.

SIER-BATH GEAR CO.
NORTH BERGEN NEW JERSEY

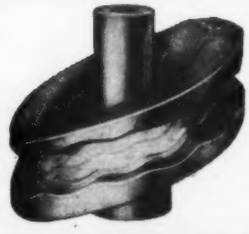
"HARTFORD" for Gears, Cams, Thread-Grinding



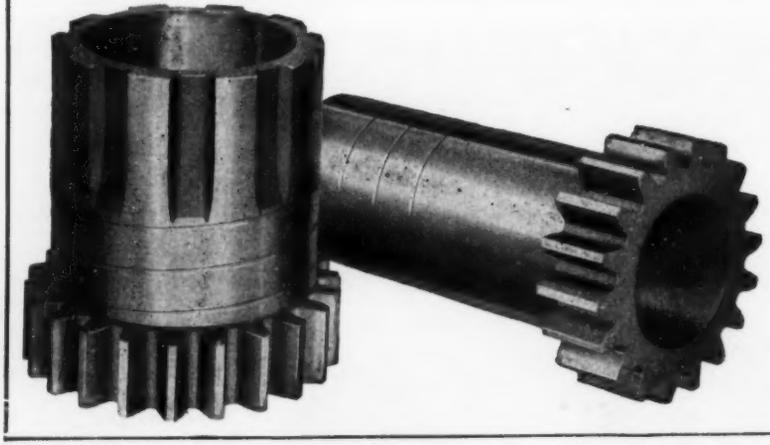
OUR SERVICE INCLUDES:

- . . . cutting gears of every description exactly to specifications
- . . . grinding gears, cams and threads
- . . . furnishing aeronautical parts on a contract basis

You plan and we execute—assuring speedy production, prompt delivery and reasonable price. Send blue prints or samples for estimate.



THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.



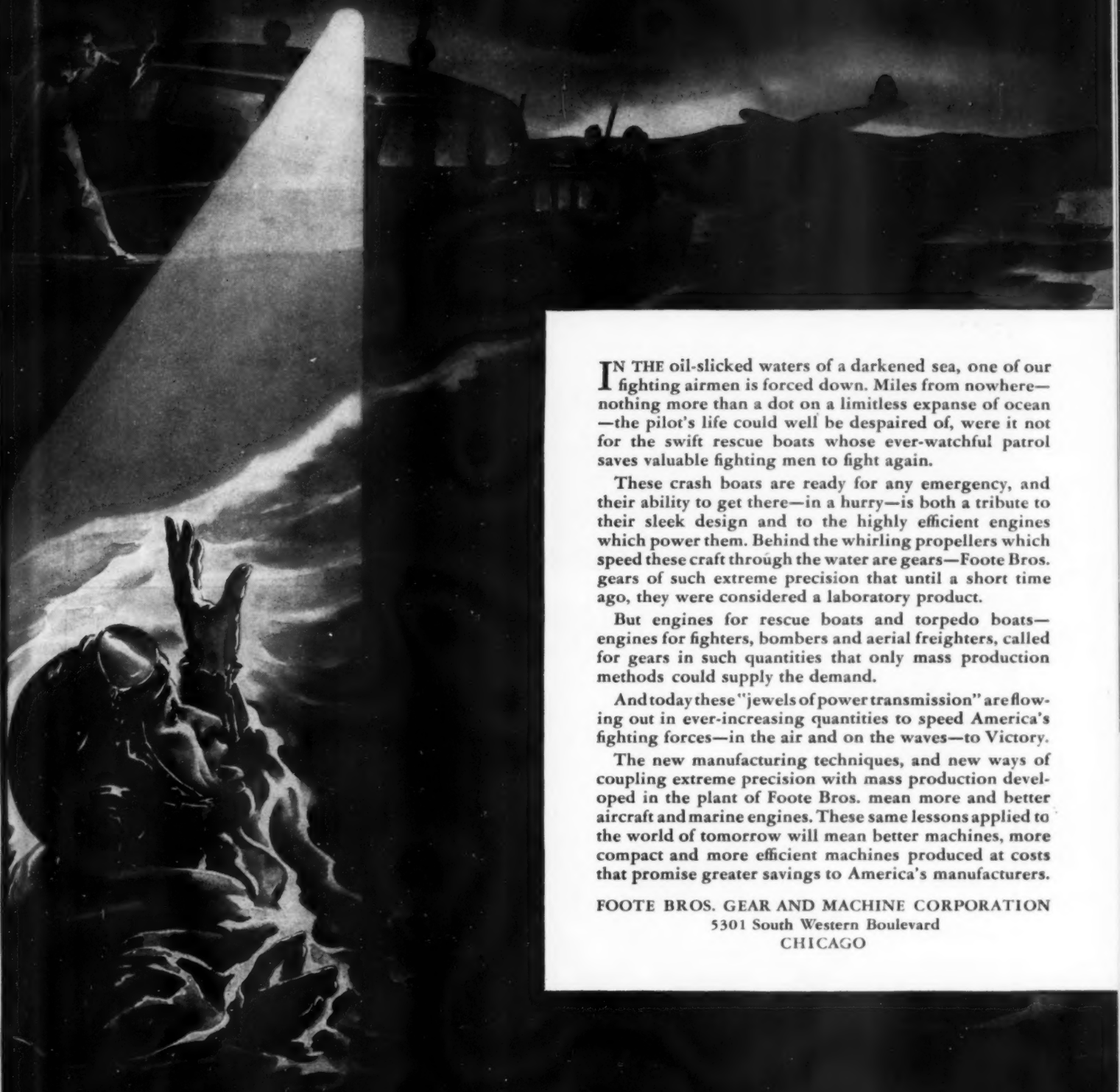
ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
1942 Bridge St. Dubuque, Iowa

He'll live!...to fight again



IN THE oil-slicked waters of a darkened sea, one of our fighting airmen is forced down. Miles from nowhere—nothing more than a dot on a limitless expanse of ocean—the pilot's life could well be despaired of, were it not for the swift rescue boats whose ever-watchful patrol saves valuable fighting men to fight again.

These crash boats are ready for any emergency, and their ability to get there—in a hurry—is both a tribute to their sleek design and to the highly efficient engines which power them. Behind the whirling propellers which speed these craft through the water are gears—Foote Bros. gears of such extreme precision that until a short time ago, they were considered a laboratory product.

But engines for rescue boats and torpedo boats—engines for fighters, bombers and aerial freighters, called for gears in such quantities that only mass production methods could supply the demand.

And today these "jewels of power transmission" are flowing out in ever-increasing quantities to speed America's fighting forces—in the air and on the waves—to Victory.

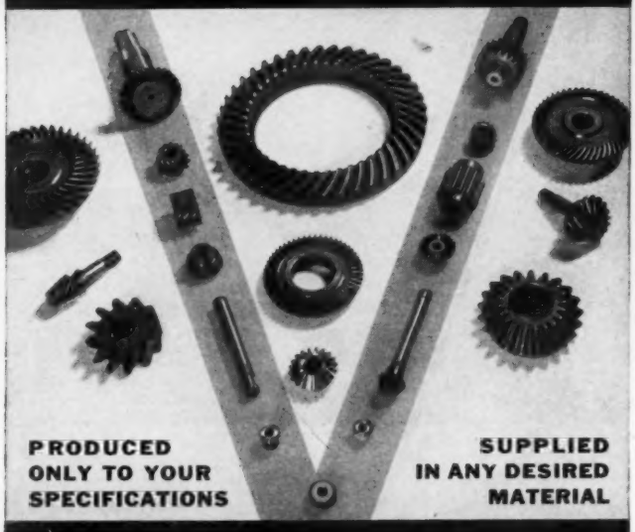
The new manufacturing techniques, and new ways of coupling extreme precision with mass production developed in the plant of Foote Bros. mean more and better aircraft and marine engines. These same lessons applied to the world of tomorrow will mean better machines, more compact and more efficient machines produced at costs that promise greater savings to America's manufacturers.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5301 South Western Boulevard
CHICAGO

FOOTE BROS.

Better Power Transmission Through Better Gears

PRECISION GEARS 5/16" to 16"



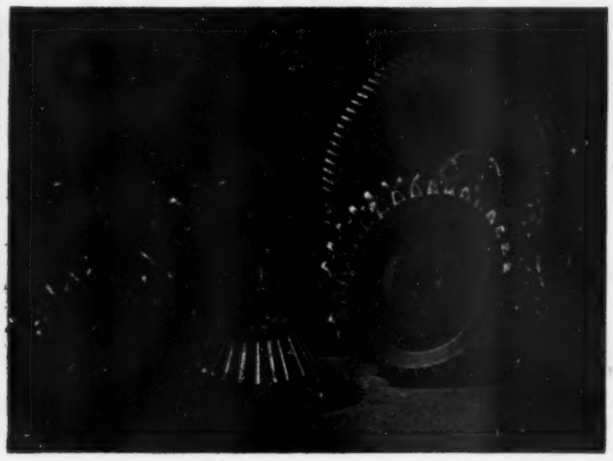
PRODUCED ONLY TO YOUR SPECIFICATIONS

SUPPLIED IN ANY DESIRED MATERIAL

DETROIT BEVEL GEAR COMPANY

8130 JOS. CAMPAU AVE.
DETROIT, MICH.

Makers of Quality Gears for 30 Years



"From the smallest Gear up to 72" diameter.

"Whether your drawings call for standard or special Gears, you will find Grant Gears will give you the high efficiencies and economies that present-day requirements demand."

GRANT GEAR WORKS BOSTON

- SPUR
- BEVEL
- HELICAL
- SPLINE
- WORM
- SPECIAL

Although we are making many times as many gears in 1942 as we did in '41 . . . you'll find no let down in Cincinnati Gear precision . . . performance or quality.

It's our job to make gears . . . it's the job we know best. This statement is being proved in hundreds of plants in production for victory.

"GEARS GOOD GEARS ONLY"

THE CINCINNATI GEAR COMPANY

"Gears . . . Good Gears Only"

1825 Reading Road • Cincinnati, Ohio

BILGRAM QUALITY GEAR

ALL TYPES • ALL MATERIALS

BILGRAM GEAR & MACHINE WORKS

1217-35 Spring Garden, Philadelphia, Pa.

---a "DEGREE" in gear perfection

"Gears by Meisel" . . . These two letters signify thirty-three years of specialization in the art of gear design. They symbolize the *construction of gears for specific purposes* which, by their inherent accuracy, assure the highest possible degree of mechanical perfection. Lay your problem before a MEISEL Gearist to determine the *one* gear suited for your job.

An interesting brochure, entitled "Gear Craftsmanship," will be mailed FREE upon request.

MEISEL PRESS MFG. CO.

946 Dorchester Ave., Boston, Mass.

How McNeil Akron Tire Presses use Ohio PRECISION Gears TO HELP "KEEP 'EM ROLLING"

The bewildering rubber shortage ballyhoo has wholly obscured the fact that tire plants are continuing their day-in-day-out production at greater speeds than ever before. Jeeps, army trucks and guns have an insatiable appetite for tires. So, many of the leading tire plants are depending on speedy McNEIL AKRON curing presses to help them meet their high daily quotas.

On the McNeil Akron press, a special Ohio Gear worm and worm wheel transmits power from the high torque motor to identical crank gears located at the ends of the shaft shown just back of the molds. These crank gears provide the motion which opens and closes the huge molds, automatically stripping the tires from the molds in the opening operation.

"We have been using OHIO GEARS exclusively," say officials of the McNeil Machine & Engineering Co., "because they have proved so satisfactory and because OHIO GEAR engineers have cooperated so fully with our own engineering department in working out the types of transmission needed for our equipment. We've found OHIO GEAR CO. highly satisfactory too, from a price and delivery standpoint."

Transmitting power in tire curing operations is another way in which OHIO GEAR engineering skill and manufacturing experience is contributing to industry's huge war effort.

★ ★ ★

*NEW YORK CITY, N. Y.
Patron Transmission Co.
154-156 Grand Street

NEW ENGLAND
George G. Pragst
332 Main St., Pawtucket, R. I.

*LOS ANGELES, CALIF.
J. W. Minder Chain & Gear Co.
927 Santa Fe Avenue

GRAND RAPIDS, MICH.
W. H. Slaughter
1924 Madison Ave., S. E.

*PITTSBURGH, PA.
Standard Machinists Supply Co.
South 2nd and McKean Street

DETROIT, MICH.
George P. Coulter
322 Curtiss Building

**Stocks carried.*

*MINNEAPOLIS, MINN.
Industrial Supply Co.
717 S. Eighth Street

BUFFALO, N. Y.
F. E. Allen, 2665 Main St.

*KANSAS CITY, MO.
Kansas City Rubber & Belting Co.
712 Delaware Street

*SAN FRANCISCO, CALIF.
Adam-Hill Co.
244-246 Ninth St.

LOUISVILLE, KY.
Alfred Halliday, 330 Starks Bldg.

*INDIANAPOLIS, IND.
A. R. Young
715 Fort Wayne Avenue

ST. LOUIS, MO.
St. Louis Tool Co.
2319 N. Ninth Street

★ ★ ★

THE OHIO GEAR CO.
1326 E. 79th Street • Cleveland, Ohio

OHIO GEARS

THE JOHNSON FRICTION CLUTCH

The NEW "MAXITORQ"

MULTIPLE DISC DESIGN IS SIMPLY ADJUSTED and EASILY CONTROLLED

Double

The use of separator springs between the active discs in the JOHNSON "MAXITORQ" FLOATING PLATE CLUTCH assure quick disengaging and prevent excessive drag. Abrasion and heat common to many clutches of the multiple disc type are absent in the "MAXITORQ."

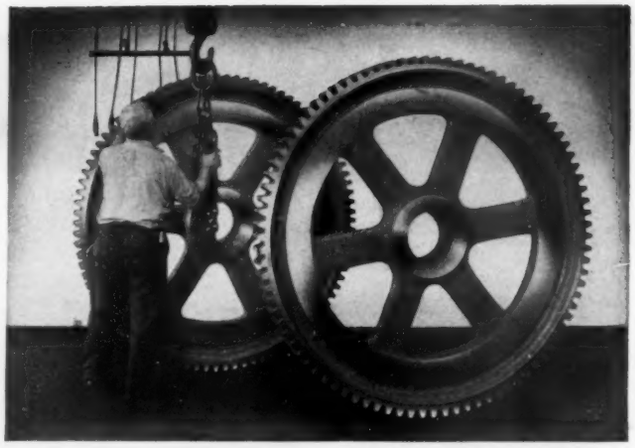
This new development by Johnson is provided with a very simple manual adjustment so that smooth operation can be maintained under all power transmission requirements. Sensitive starting, safety and quietness are other advantageous operating features.

Single

Made in capacities from ½ HP to 5 HP at 100 R.P.M. in single, double and cut-off coupling types. WRITE FOR DIMENSION SHEETS covering all sizes and types.

Write for Multi-Disc clutch catalogue No. 122 or consult Sweet's or Thomas' Reg.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN



BIG *and* TOUGH

STAHL TAKES THEM ON

Whether you need big husky, tough gears or small gears to exacting specifications, come to Stahl — we're equipped to produce any kind of gear in any size and give you prompt service.

Our ability to "take on" any thing in the line of gears is possible through our modern, efficient facilities and our long, specialized experience in the design and production of gears of all types, sizes and materials.

Send us your specifications—ask us to quote. We can satisfy your requirements as to quality, quantity, shipment and price.

THE STAHL GEAR & MACHINE COMPANY

3901 Hamilton Ave. **Cleveland, Ohio**

BEVEL GEARS...
Earle Bevel and Miter Gears and Pinions are made with either planed or generated teeth, of any gear material, in sizes from ½" to 13 feet in diameter. Accuracy and finish are such as to insure smooth, efficient operation and long life.
In addition to bevel gears, Earle manufactures a full range of gear types and sizes—in practically every gear material. Send for the Earle Gear booklet 42-G which contains full detailed information.
THE EARLE GEAR & MACHINE CO.
4723 Stenton Ave., Philadelphia, Pa.
EARLE GEARS

Accurate, High-Speed

MOREY VERTICAL SHAPERS

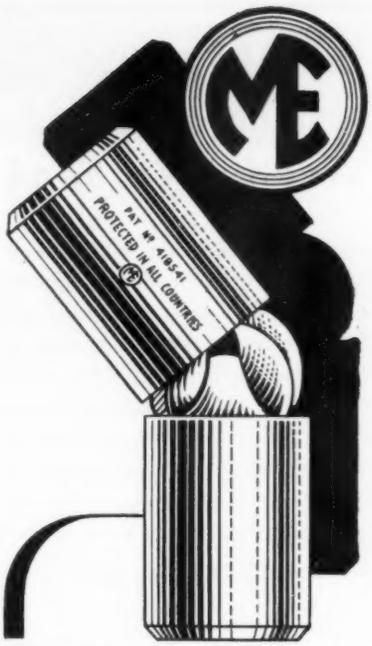
8" STROKE
12" STROKE
14" STROKE

SELF-CONTAINED MOTOR DRIVE

Precision . . . Easily handled — your operators will appreciate it . . . **Cutting Stroke** changed quickly . . . **Feeds** varied instantly . . . **Power** rapid traverse in all directions . . . **Brake** for ram automatically applied . . . **Bijur Lubrication** . . . **Timken Bearings**—Bull gear mounted on Timken Bearings. Roller table mounted on Timken Bearings . . . **Modern Design**—built to the highest standards of workmanship and materials—simplified operation, powerful yet finger-tip control

DESIGNED AND BUILT BY ***Ask for Circular No. 726***

MOREY MACHINERY CO., INC.
410 Broome Street **New York, N. Y.**



Patent

UNIVERSAL BALL JOINTS

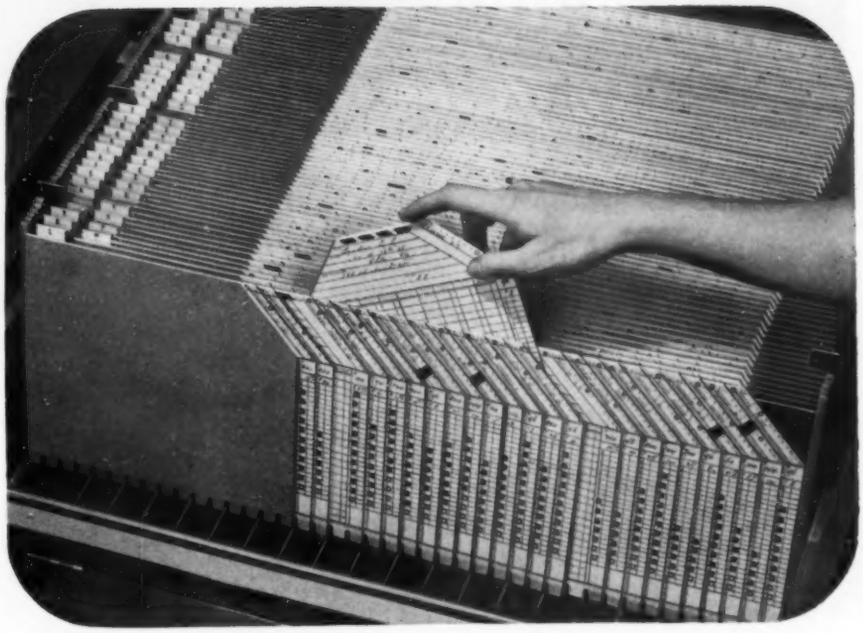
- Made in a range of 9 sizes for shaft diameters ¼" to 1⅛".
- Standard Joints have maximum angle of 38° from the straight line.
- Made by the largest manufacturers of UNIVERSAL JOINTS in Great Britain.
- Widely used in Machine Tools, accessory drives and on Aircraft.
- Certified 92% to 98% efficient by the British Government's National Physical Laboratory.

Catalogues on request.

The
MOLLART
Engineering Co., Ltd.

KINGSTON BY-PASS, SURBITON,
SURREY, ENGLAND.
Telegrams: PRECISION, SURBITON.

Control



Double Counter Height Desk
capacity up to 40,000 records

Single Pedestal Desk
capacity up to 12,500 records

Posting Tray
capacity up to 5,000 records

Executive Desk Model
capacity up to 700 records

SIMPLIFIED WITH *VISI*record

*VISI*record Control is not a new system of record-keeping, but an all around better method! It utilizes the best features of modern visible equipment (without the use of wires, clamps or pockets)—and combines them in an exclusive Visible arrangement that makes an open book of hitherto dark, complex operations. Facts and figures that are required for constant reference, comparison or computation become live, purposeful records . . . a veritable panorama of production or progress—responsive to the touch—and alive with a triple margin visibility.

There are scores of additional *VISI*record advantages such as unrestricted card sizes, positive control of misfiled cards, signalling and charting . . . and portability! Entire sections may be moved in units for those hasty progress-report conferences when facts and figures speak louder than words!

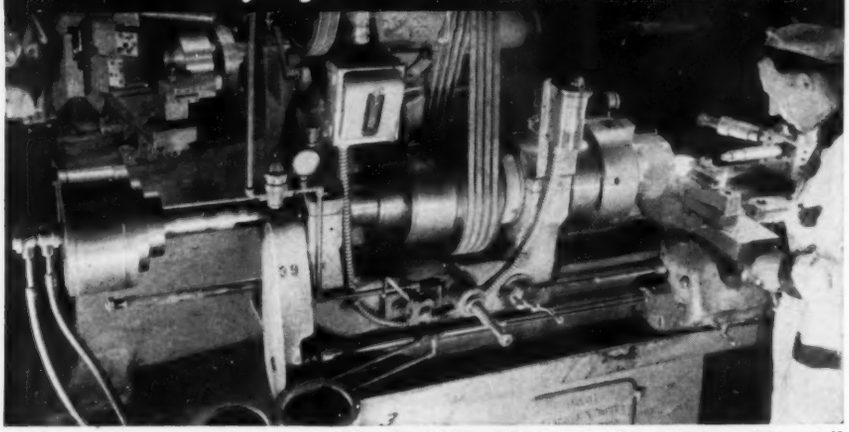
Costs lots less to install, operate and maintain than bulky, outmoded equipment.

Write for Booklet 37, "Keep These Vital Records Up to the Minute." There's no obligation.

VISIrecord

VISIBLE INDEX CORPORATION
535 FIFTH AVENUE, NEW YORK, N. Y.
OFFICES IN PRINCIPAL CITIES

How to Make PRODUCTION EQUIPMENT of your old Lathes

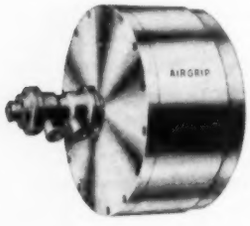


This World War I lathe, now fitted with an "Airgrip" air cylinder, is in a World War II mass production line.

Output Can Be Increased 25%, or More!

You can make production equipment out of your old lathes —increase their output more than 25%—by fitting them with Anker-Holth high speed revolving air cylinders and air-operated chucks.

And, you do not have to wait to take this progressive step, because most sizes of "Airgrip" air cylinders are *available on reasonably prompt delivery.*



Anker-Holth air cylinders step up production more than 25%.

When you check air cylinder requirements with us, also investigate Anker-Holth air operated universal three jaw chucks, collet chucks, expanding arbors, and shell holding equipment. They will help you do more work —at lower cost!

WRITE FOR BULLETIN!

Anker-Holth Mfg. Co.

"AIRGRIP" CHUCK DIVISION
332 So. MICHIGAN AVE. • CHICAGO, ILL.

MAKERS of PLANES and ENGINES . . . *Need this book*

From the Armament Sections of *American Machinist* come these up-to-the-minute, practical data on planes, parts and engines, written by production men in leading plants. Illustrated with large, clear drawings and photographs. Widely used and praised by production men in aircraft and automotive plants and subcontractors.

SUBJECTS INCLUDE:

Sheet Shapes for Aircraft (Lockheed)
Curtiss Landing Gear for Fighters
Hydraulic Cylinders at Bendix
Fixtures Step Up Output at Kinner
Jigs for Assembly at Republic
Fabricating the Flying Fortress
Inspection at North American
How Wright Builds Engines
Line Production at Wright
Allison Engine Methods
Menasco Makes the "Pirate" Engine
Building the "Ranger" Engine
Packard Fixtures Check Castings
Building the Martin Bomber
How Airacobras Are Built
Machine-Made Planes at Vultee
Profiling & Forming at Vultee
Conveyors in Vultee Production
Flush Riveting at Bell Aircraft
Vega Applies Cast Dies
The Guerin Process for Stamping with Rubber Dies
Aircraft Parts from Bendix
Stainless Steel in Aircraft (Fleetwing)
Plane Parts from Strip (Consolidated)

184 pages—8½ x 11
fully illustrated

$1

MAIL THIS COUPON NOW

Send ..... copies of "Plane and Engine Manufacture" at $1 per copy. I inclose $..... (check, money order, stamps or cash)

Name .....

Address .....

.....

Position .....

Company .....

AMERICAN MACHINIST
330 W. 42 St., New York, N.Y.

GUN MANUFACTURERS!

Do you have this Textbook?

• Thorough, practical, how-to-do-it information on making guns and parts—written by and for practical production men—with large, clear, drawings and photographs. All material from the Armament Sections of *American Machinist*.

SUBJECTS INCLUDE:

How G. E. Makes 75-mm. Pack Howitzers at Erie

Bore Operations on Medium-Calibre Guns at Watervliet

Sorel's Methods in Making the British 25-Pounder

How to Make 40-mm. Bofors Anti-Aircraft Barrels

Pontiac's Procedure on the Oerlikon 20-mm. A.A. Gun

Arc-Welded 37-mm. Gun Carriages

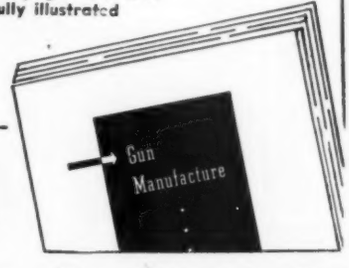
General Motors Methods on 30- and 50-cal. Machine Guns

Manufacture of Bren Machine Guns in Canada

Garand Production Methods at Springfield Armory

Farquhar's Manufacture of the 81-mm. Trench Mortar

144 pages—8½ x 11
fully illustrated



$1

MAIL THIS COUPON NOW

Send ..... copies of "Gun Manufacture" at $1 per copy. I inclose $..... (check, money order, stamps or cash)

Name .....

Address .....

.....

Position .....

Company .....

AMERICAN MACHINIST
330 W. 42 St., New York, N.Y.

This Booklet WILL TELL YOU HOW..

. . . YOU CAN MAKE YOUR GAGE BLOCKS LAST LONGER

With the increased use of gage blocks on production lines and the "breaking in" of new men and women on checking operations it is important that they know how to use these standards. The Dearborn Gage Company, Originators of the Chromium Plated Gage Blocks has written this booklet as an aid to those manufacturers who want to keep their standards in perfect condition for more accurate readings. By letting your workmen read this booklet you can increase the life of your gage blocks and at the same time save unnecessary interruptions in production due to imperfect readings. There is no obligation on your part. Merely write us today for the free booklet entitled, "How To Make Your Gage Blocks Last Longer".

DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

Write for your copy NOW!

DEARBORN GAGE COMPANY,
22035 Beech Street,
Dearborn, Michigan

Gentlemen:

Without obligation, please send me your booklet entitled, "How To Make Your Gage Blocks Last Longer".

Name.....

Company.....

Position.....

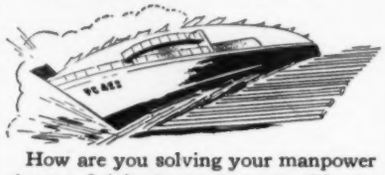
City..... State.....

Westinghouse

FLEXARC WELDING FACTS

TIMESAVER ON SUBCHASERS

(Reading Time . . . 45 Seconds)



How are you solving your manpower shortage? A basic step is to simplify the machines your workers must handle. For example, here's how a Midwestern shipbuilding company saves manhours for building more PC boats.

. . .

It's just plain common sense that machinery with moving parts requires more maintenance checks than a machine without moving parts. So this boat builder bought only "maintenance free" Westinghouse A.C. Welders for his metal joining work.

. . .

As a result, his welding machine maintenance crew was reduced to a bare few. And his old operators and "green" men are producing better welds, faster—just because Westinghouse A.C. Arc Welders are so dog-gone simple to operate.

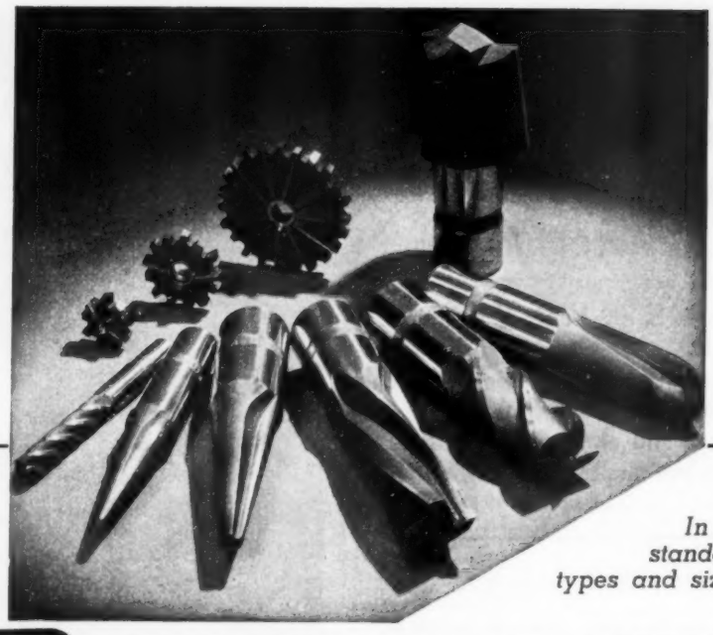
. . .

Welds are even easy in a PC boat's "hard-to-weld" joints because A.C. welding eliminates magnetic arc blow. Even at high current, the A.C. arc bites into corners—produces uniformly sound welds . . . fast.

. . .

A.C. welding offers many advantages that are especially valuable today. Get complete facts. Ask your Westinghouse representative or write for catalog B-3136.

Westinghouse Electric & Mfg. Co.
Dept. 7-N, East Pittsburgh, Pa.
J-21259



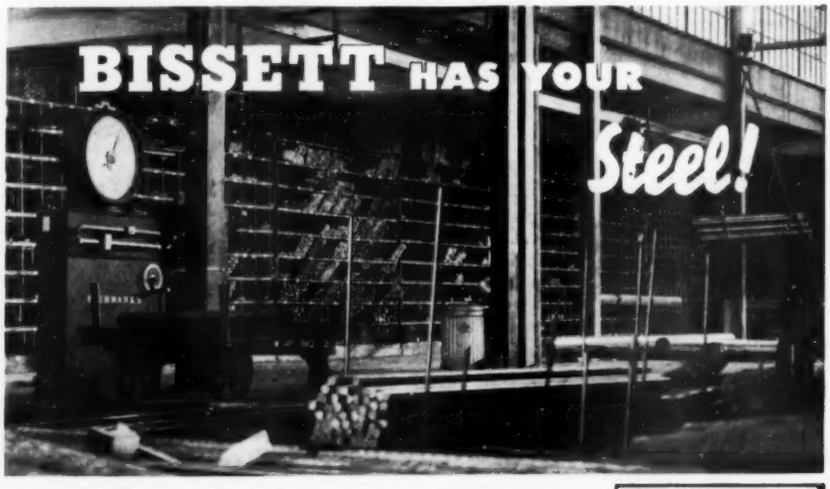
In all standard types and sizes.

T-J DIE SINKING MILLING CUTTERS

are sturdy, hold a sharp edge and carry less breakage percentage. They meet even today's production requirements with more work between grinds.

write for catalog No. 139 to
615 N. Mechanic St., Jackson, Mich.

THE TOMKINS-JOHNSON CO.



READY TO SHIP DIRECT TO YOU

★ Aircraft Steels ★ Alloy Steels ★ Ball Bearing Steel
★ Boiler Tubes ★ Chisel Steel ★ Cold Finished Steels
★ Cumberland Ground Shafts ★ Drill Rod
★ High Speed Tool Bits ★ S.A.E. Steels ★ Shim Steel
★ Strip Steels ★ Spring Steels ★ Tool Steels
★ Tool Steel Tubing

USE THIS BOOK
110 pages of listings, grades, weights, sizes, useful data and information, FREE.

★ ★ ★ ★ ★ ★ ★ ★ ★

BISSETT Steel

945 E. 67TH STREET · CLEVELAND OHIO · HENDERSON 0995

How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

*

Good advertising speeds information from those who have it . . . to those who need it.

*

McGraw-Hill Publishing Company, Inc.

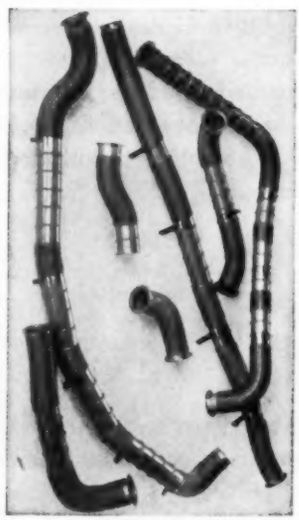
330 West 42nd Street New York

In War Time, It's . . .

FLEXPEDITE

★ **Achieve design flexibility, conserve vital materials, speed conversion, assembly and production by utilizing flexible metal connections—specifically..**

REX *Flexible* METAL HOSE



Units Shown are Typical Vari-formed Assemblies.

The many production types of REX Flexible Metal Hose offer the widest range of adaptability—for simplifying re-design problems where space limitations and flexibility are imperative—for conserving more critical materials—for solving every kind of fluid and gas handling problem.

REX Flexible Metal Hose speeds manufacture by facilitating assembly. It can be bent to position or "snaked" into place and coupled in a fraction of the time required to fit multi-plane pipe connection. Easily attached fittings for every requirement. REX Flexible Metal Hose withstands severe flexing and vibration. All in the interest of war time economy

FLEXPEDITE *YOUR* PRODUCTION

Write for data and engineering recommendations on specific problems involving flexible connections.

REX-WELD Corrugated Flexible Metal Hose • REX-TUBE Interlocked Flexible Metal Hose
REX-FLEX Stainless Steel Flexible Tubing • AVIOFLEX Oil Line Hose • CELLU-LINED Hydraulic Hose

Copyright, 1942, Chicago Metal Hose Corporation, Maywood, Illinois

CHICAGO METAL HOSE CORPORATION

General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Ill.

★ ★ ★ ★ "A product is only as good as the men and machines who make it" that is the reason why we employ the highest type of skilled men who have had years of experience in their respective jobs.

Using modern equipment and working in a plant that was built expressly for the manufacture of gages these men are not only making the finest gages, but they are also working to their fullest capacity to help produce more to help win this war!

With this combination of skilled men and modern equipment PERFEX offers manufacturers gages that are recognized throughout industry as the most accurate made. For a complete description of PERFEX gages write us today for our new folder.

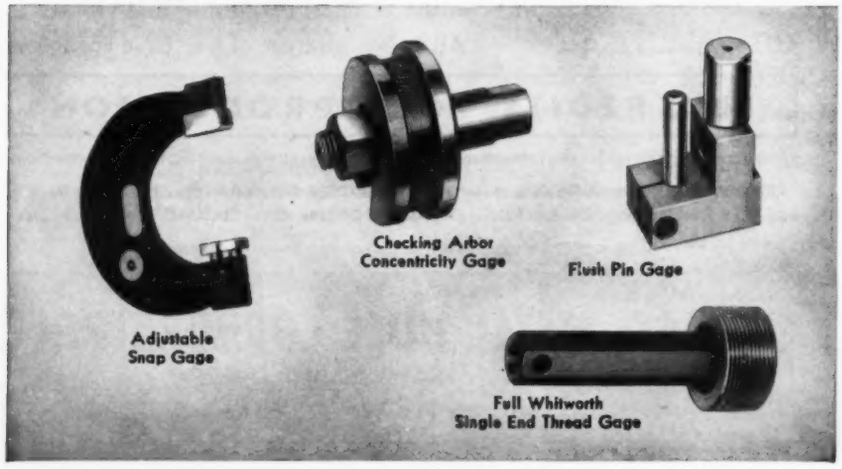
PERFEX GAGES INCLUDE:

★ Thread Plug | Radius Contour | Profile Flush Pin | Adjustable Snap Solid Snap, etc. ★

ACCURACY PERFEX OUR CREED

PERFEX GAGE and TOOL CO.

3602 GAYLORD DETROIT, MICHIGAN



Working with

UNFAMILIAR and DIFFICULT MATERIALS?

★ October 5, 1938, *American Machinist* inaugurated its regular series of "Working of Materials" sections. These familiar, and highly respected, "blue sections", compacted from suggestions and practices of authorities in each field, are now used extensively by Metal-Working plants busy on armament orders.

Each details characteristics of a particular material, or group of materials, and gives latest practical data on fabrication. They will help you—and are typical of the useful and exclusive editorial content that *American Machinist* brings you fortnightly.

Over 115,000 reprints have been requested, exhausting our stocks on a number of subjects. Those listed below, however, are still available, although stocks on some are limited. If you want extra copies, order *now* while our supply lasts.

1 **Working of Aluminum Alloys**
2 **Working of Magnesium Alloys**
3 **Working of S A E Nickel Alloy Steels**
4 **Working of Nitriding Steels**
5 **Alternate Steels for Emergency Use**
6 **Working of Carbon Sheet Steel**
7 **Working With Cutting Oils**

15 Cents per copy as long as our limited supplies last

MAIL COUPON . . NOW

Please send me at once the following special "Working of Materials" sections from AMERICAN MACHINIST. I inclose 15 cents (stamps, money order or check) for each section ordered.

1 2 3 4 5 6 7

(Order by circling number)

NAME .....

TITLE .....

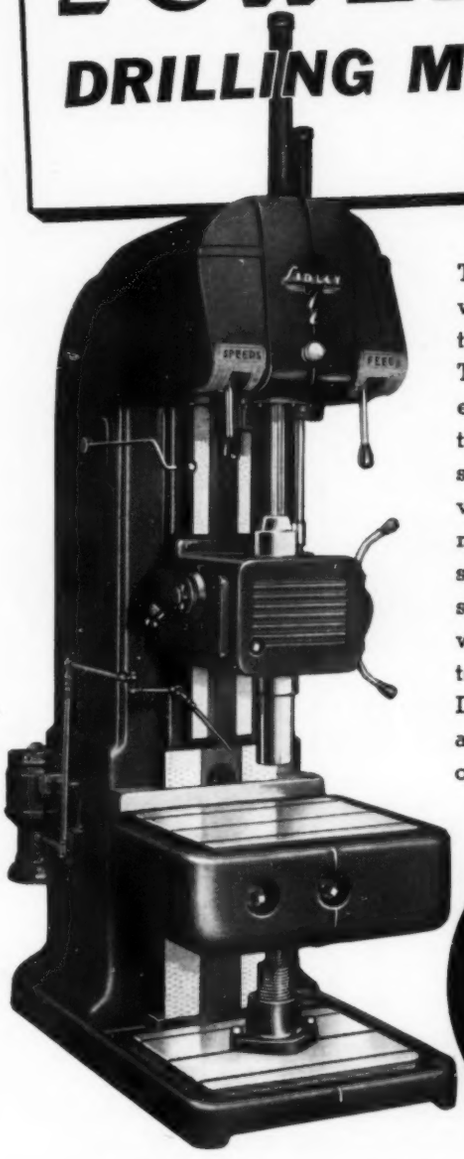
COMPANY .....

ADDRESS .....

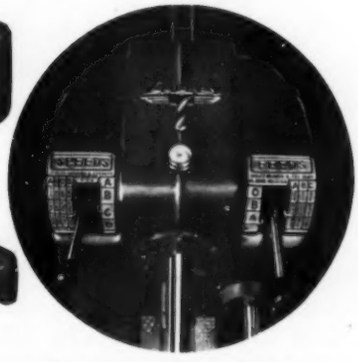
American Machinist

330 West 42nd St., New York

NEED A POWERFUL DRILLING MACHINE?



Today's tough drilling on war work doesn't bother users of the Sibley 25" Geared Drill. The tremendous power and extreme accuracy built into this machine make it well suited for armor plate and various hardened steels. Will maintain a selected feed and speed under heaviest pressure. Straight production work is held to the closest tolerances, and the Sibley Drill's ease of control makes it adaptable to frequent change-over on small quantities.



HERE'S WHY ACCURACY AND POWER ARE ASSURED IN THE SIBLEY DRILL

- ★ Geared drive with alloy steel, heat-treated gears in oil bath. Horizontal shafts mounted on anti-friction bearings.
- ★ Controls centered in front. Instant change of feeds and speeds.
- ★ 12 spindle speeds from 75 to 1500 RPM. 9 feeds from .005" to .045".
- ★ Tapping by electrical reversing switches.
- ★ 10 splined spindle operated by power and hand feed.

SIBLEY MACHINE AND FOUNDRY CORP.
8 EAST TUTT ST., SOUTH BEND, INDIANA

★Are you using this American Machinist "SHELLBOOK"...?

• If you are making bullets, shot, shell, cartridge cases or clips, here is the last word on current practice, including the famous shell-tooling series by B. C. Brosheer. This book has become the standard text for contract discussion with the Ordnance Dept. Twice the size of the early "Shellbook," with large clear drawings and photographs—from the Armament Sections of *American Machinist.*

SUBJECTS INCLUDE:

Bullets for Britain—from Canada
Ammunition for the Air Force
Shell Forging by the Upset Method
3.7-in. Shell Forgings
Forging 155-mm. Shell Bodies
Standard Machines for Shells
How to Machine 75-mm. Shell
Production of 3-in. A.A. Shell
Tooling H. E. Shell (5 parts)
Canada Supplies 40-mm. Shell
Aircraft Bomb Fuzes
Producing Percussion Fuzes
Machine-Gun Cartridge Links
Artillery Cartridge Cases
Shell Cases Made in Canada

240 pages—8½ x 11
fully illustrated

$1

MAIL THIS COUPON NOW

Send ..... copies of "Artillery and Small-Arms Ammunition", at $1 per copy. I inclose $..... (check, money order, stamps or cash)

Name .....

Address .....

.....

Position .....

Company .....

AMERICAN MACHINIST
330 W. 42 St., New York, N.Y.

Why 3 Types of Surface Plates

	SIZES	APP. WEIGHT	BEARING SURFACE	TOLERANCE
A	24 x 36	450	20 - 25	.0001
B	24 x 36	450	12 - 15	.0003
C	24 x 36	450	6 - 8	.001

Because — only in having three different tolerances can we supply you with the economically efficient plate best suited for your needs.

A — MASTER ACCURATE SURFACE PLATES
Note the extreme accuracy and .0001 - .0002 tolerance and 20 - 25 bearings per square inch, constant in all sizes from 14 x 18 to 48 x 96.

B — ACCURATE SURFACE PLATES
Same weight, size and famous 3 point suspension as in type A. The .0003 - .0004 tolerance and 12 - 15 bearings per square inch are constant in all sizes.

C — SURFACE PLATES
Same as A & B except hand scraping is not carried so far. Has .001 - .0015 tolerance and 6 - 8 bearings per square inch. Planer finish plates also available.

LOMBARD GOVERNOR CORPORATION
200 MAIN ST., ASHLAND, MASS., U. S. A.

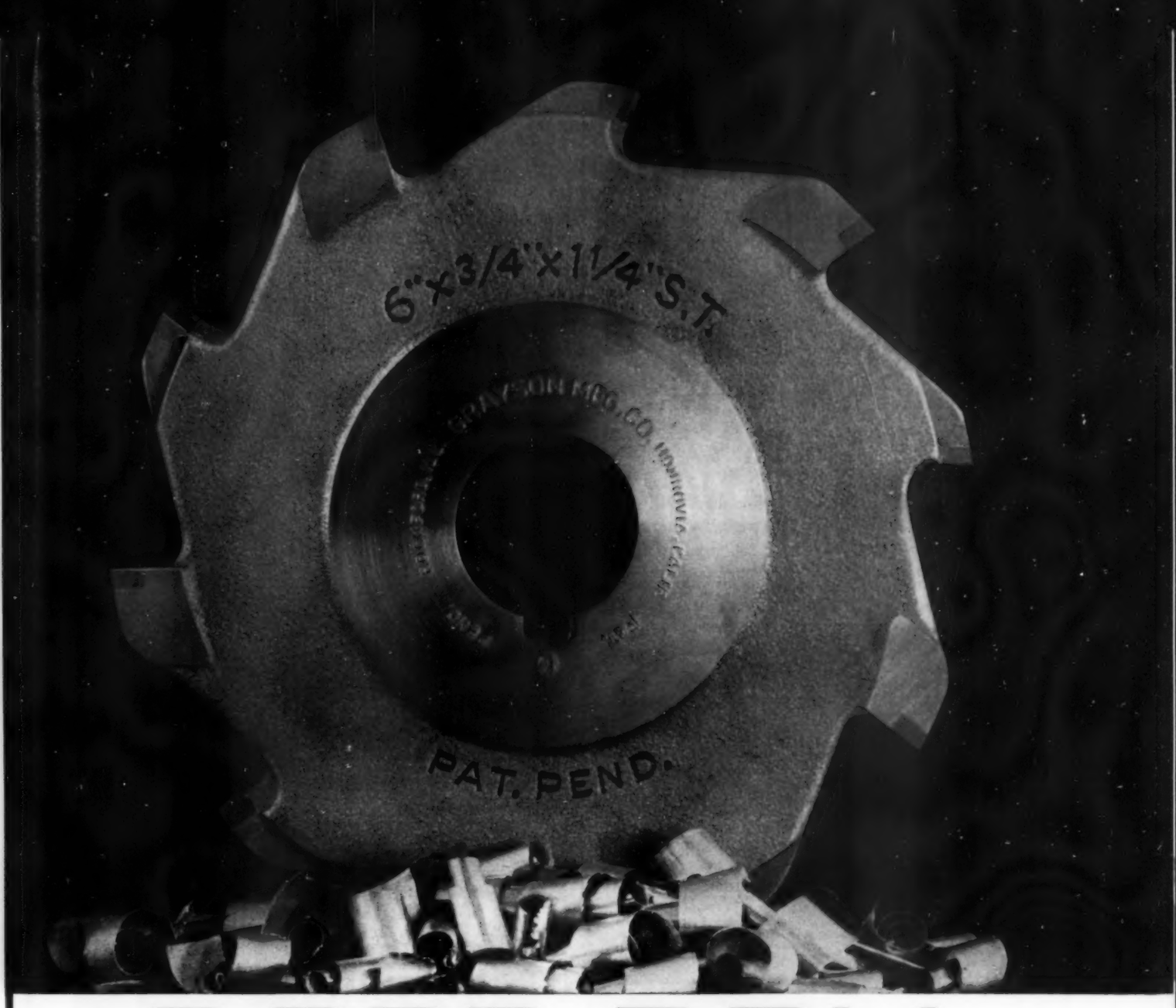
MAKING MORE FILES THAN EVER BEFORE *but with no sacrifice of quality*

The vastly increased demand for "American Swiss" Swiss-Pattern Files in every war industry has not . . . and will not . . . affect the high standards of care and accuracy to which these files have always been made. When you buy "American Swiss" files for your accurate and intricate filing jobs, you can do so with every assurance that these precision tools are, as always, uniformly excellent in every respect, and that orders will be filled with the utmost promptness permitted by priority ratings.

3000 Different Types and Sizes . . . . . Buy from Our Distributor

AMERICAN SWISS FILE & TOOL CO. • ELIZABETH, NEW JERSEY

American Swiss
SWISS-PATTERN FILES



6,000 R.P.M.

150" FEED PER MINUTE

Vega Aircraft reports this actual performance of **Grayson Cemented Carbide milling cutters,** on aluminum. With a 6" Staggered-Tooth mill (actual-size photograph above), a surface speed of **9,425 feet per minute** was attained, with a cut 1 ⅛" deep and ⅜" wide. And, after a long run, microscopic observation of the carbides showed no ill effect.

Naturally, such speeds and feeds are beyond the capacity of most machines. But this gives some indication of the possibilities of milling with **Grayson** cutters. Charts for speeds and feeds, on metals from **aluminum to 4340 chrome-nickel,** are provided with cutters, to help machine operators obtain maximum results.

Grayson Manufacturing Company

MONROVIA, CALIFORNIA

TALCOTT BUILDING, ROCKFORD, ILLINOIS

MAKE EXTRA MONEY!

You can have extra money by conducting a business of your own in your spare time by taking orders for the

Big Seventh Edition

of the

AMERICAN MACHINISTS' HANDBOOK

Every man in your shop and other shops will find this practical Handbook of 1368 pages as useful as any tool in his kit.

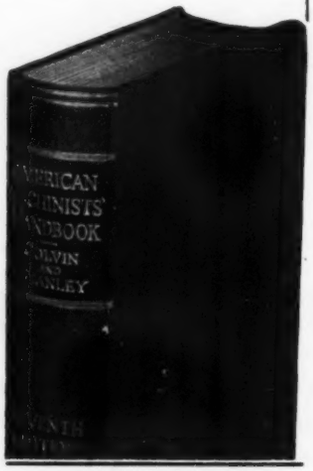
Our spare time representatives in large and small shops have successfully sold thousands of copies of previous editions of the Handbook with profit to themselves.

HERE IS THE PLAN

This new seventh edition will be wanted by thousands of machinists, toolmakers, draftsmen, apprentices, in fact, anyone connected or dealing with machines. This book sells itself.

You can have the agency for your shop and get a liberal commission on every book you sell.

Send the attached coupon for full details.



Without obligation to you and for the cost of a three-cent stamp you can have full details of the plan and information regarding the advertising literature sent FREE in order to help your sales.

Send the Coupon Now

MONEY-MAKING COUPON

McGraw-Hill Book Co., Inc.
330 W. 42nd St., New York

Please send me without cost or obligation to myself, your plan by which I can profitably turn my spare time into money.

AMERICAN MACHINISTS' HANDBOOK

Signed .....

Address .....

Company .....

Position .....A. 12-10-42

GILBARCO
COOLANT
PUMPS...
DEPENDABLE...
DURABLE
MODEL CE
Immersion Type
• One of a complete line of pumps for all machining operations. • Built for twenty-four hours a day service. • Instantaneous coolant delivery, self-priming, never becomes airbound. • Does not build up pressure at slow speeds. • Unharmed by abrasives in liquid—or by running dry. • Built by one of the country's largest pump manufacturers.
Write or wire for literature, prices and deliveries.
GILBERT & BARKER MFG. CO.
WEST SPRINGFIELD, MASS.

Save Critical Metals

GET BETTER PRODUCTS WITH GRAPH-TUNG STEEL

Graph-Tung uses a negligible amount of Molybdenum, no Chrome, and less Tungsten than other steels use. Still it wears longer and machines at least 25% faster than competing fast finishing steels.

Alloys in Fast Finishing Steels Competitive to Graph-Tung

Steel	Molybdenum	Chrome	Tungsten
A	.40		4.00
B			3.00
C			3.50
D			2.84
E		.25	3.60
F		.55	3.20
G			3.50
H			3.50
I		1.00	4.00
GRAPH-TUNG	.50		2.60/3.00

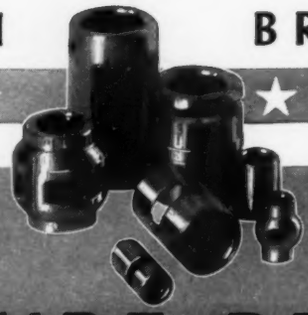
Faster and Easier
Graphitic Steels--a faster and easier way of making tools and dies--more production for Victory; greater profits in post-war competition. Start using them now.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

TIMKEN
TRADE MARK REG. U. S. PAT. OFF.
GRAPHITIC STEELS

JOHNSON BRONZE



Greater Service from your SLEEVE TYPE BEARINGS

MOST bearing failures are due either to improper fit or neglect. While manufacturers engaged in producing war material can still secure replacements with a minimum of delay, it is not only good management but also a form of patriotism to make every bearing deliver its full measure of power and efficiency. Bronze sleeve type bearings contain three very essential metals . . . copper, tin and lead. Help conserve these precious metals by following these instructions:

Inspect . . .

Adopt a regular period of inspection. In machinery that operates constantly the bearings should be checked each day. All other applications at least once a week. Make certain that bearings are in perfect alignment to prevent excess wear.

Lubricate . . .

Lubrication is the life blood of every motive unit. Start now to adopt a regular plan of lubrication for every bearing. Make sure you are using the right type of lubricant, the right grade and that it is clean.

Clean . . .

Foreign matter, particularly of a gritty or abrasive nature, is the greatest menace to bearings. By keeping the surroundings clean, we can prevent early bearing deterioration. A few minutes spent in cleaning up all applications will pay big dividends in increased bearing life and efficiency.

Replace . . .

If failure is inevitable, order in advance. Replace all worn bearings before they actually fail. Remember that bearing performance and bearing life is the true gauge of quality . . . not purchase price.

Write for a copy of our new catalogue. It lists and describes the most complete stock sleeve bearing service on the market. Every item is of the highest quality possible. Distributors in every industrial center are ready to serve you.

PRODUCTS

Cast Bronze Bearings
Cast Bronze Graphited
Sheet Bronze Bearings
Sheet Bronze Graphited
Bronze and Babbitt Bearings
Steel and Babbitt Bearings
Steel and Bronze Bearings
Ledaloyl
Self-Lubricating Bearings
Electric Motor Bearings
Automotive Bearings
Bronze Bars
Bronze Castings

JOHNSON BRONZE COMPANY

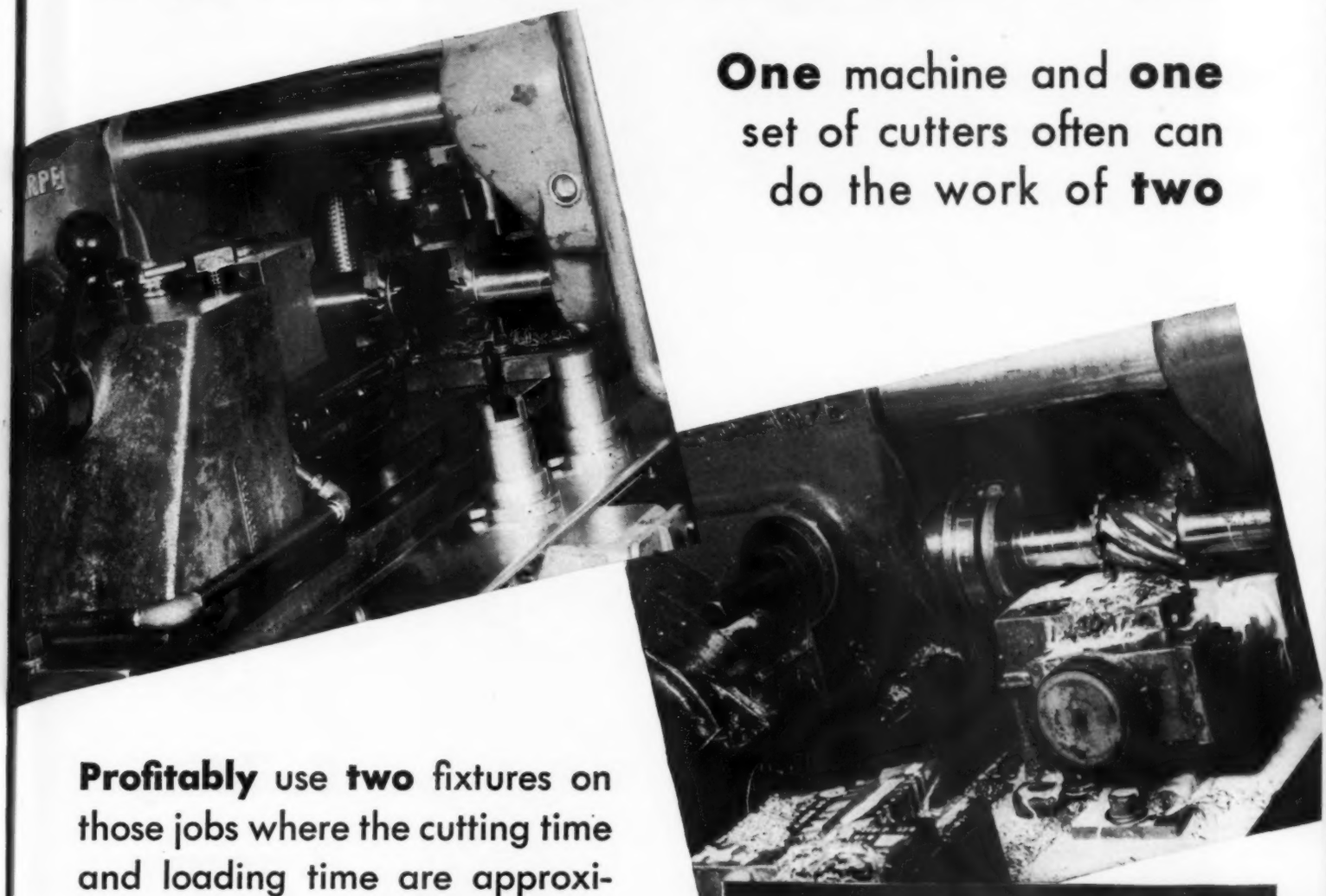
Sleeve Bearing Headquarters

515 S. MILL STREET NEW CASTLE, PA.

SALES OFFICES AND WAREHOUSES

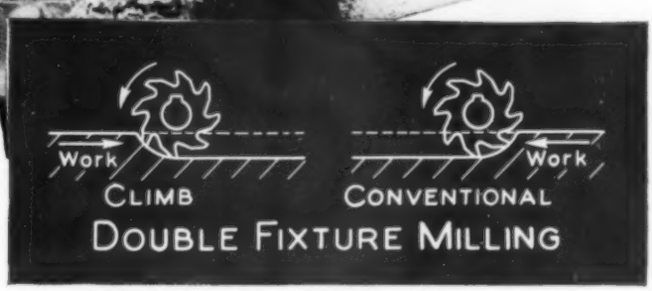
ATLANTA BALTIMORE BOSTON BUFFALO CHICAGO CINCINNATI CLEVELAND DALLAS DETROIT KANSAS CITY LOS ANGELES MINNEAPOLIS NEW CASTLE NEW YORK CITY NEWARK PHILADELPHIA PITTSBURGH ST. LOUIS SAN FRANCISCO SEATTLE

Greater Production from your No 12s!
—Use A FIXTURE AT EACH END OF TABLE



One machine and **one** set of cutters often can do the work of **two**

Profitably use **two** fixtures on those jobs where the cutting time and loading time are approximately equal—**climb** mill in one and **conventional** mill in the other . . . get greatly increased production. **Keep the cutters cutting**—load one fixture while cutting in the other.



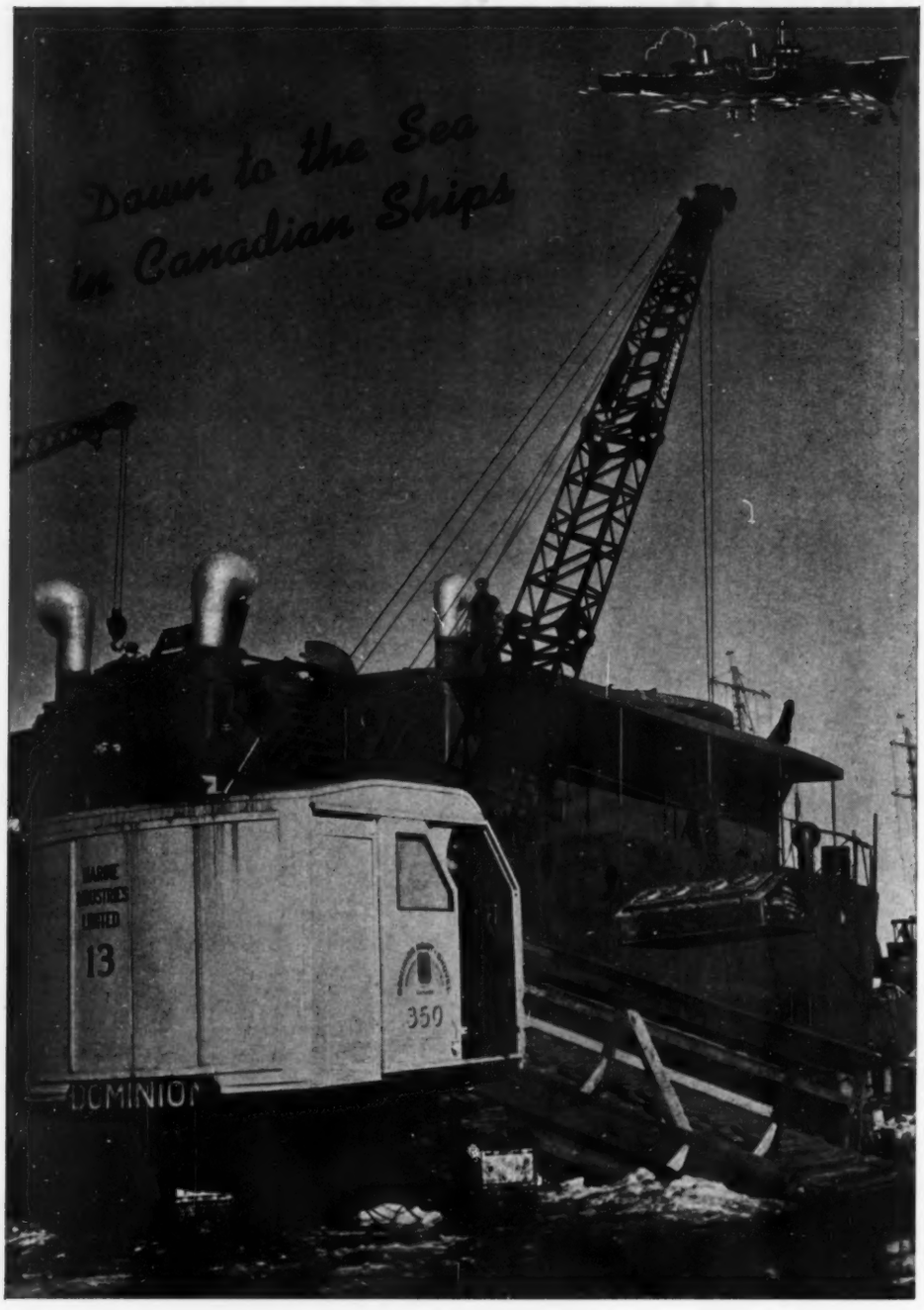
For work that **must** be climb milled, No. 12 Plain Milling Machines with spindle reverse climb mill at both ends of the table.

KEEP MACHINES PRODUCING

Keep them clean
Lubricate regularly with proper oils
Keep bearings and gibs adjusted
—A little consideration on your part will prevent unnecessary wear, breakdowns and repairs

We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.
Brown & Sharpe Mfg. Co.
Providence, R. I., U.S.A.

BROWN & SHARPE

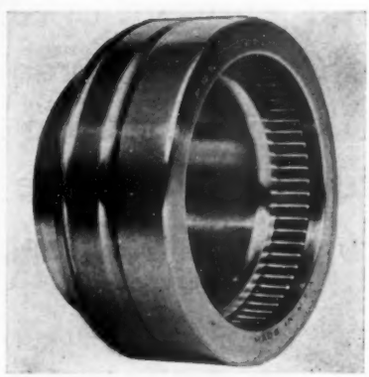


RBC

NEEDLE BEARINGS

help speed Canada's Ship Building Program

RBC Bearings are found on another production front, this time in a Canadian shipyard which is building Corvettes and Minesweepers to keep our vital sea lanes open. On this Dominion Hoist & Shovel Co. Model 350 Crane, RBC CYCLOPS Needle Bearings are given the important job of accurately meshing the gears of the horizontal reverse shaft assembly. RBC Bearings are distributed in Canada exclusively by Canadian SKF Co., Ltd., Montreal, Toronto, Winnipeg and Vancouver.



ROLLER BEARING CO. of AMERICA

TRENTON . . . . NEW JERSEY

Because Your Motors May Have to Serve for the Duration

Send for

These New Century Bulletins on Proper Motor INSTALLATION, CARE, and ADJUSTMENT

★ To help all Century Motor users get longer life from motors now in service, Century offers, free, the following helpful, informative bulletins on motor Care — Installation — Adjustment:

- Squirrel Cage Polyphase Motors, 1/6 to 400 HP
- Integral HP Direct Current Motors
- Fractional HP Direct Current Motors
- Direct Current Generators
- Repulsion Start Induction Motors
- Capacitor Motors — Fractional HP
- Split Phase Motors

Because all Century Motors and Generators now being produced must go to the War Effort, proper motor care and protection is now more essential than ever before. Century Motors are working 'round the clock, often on continuous, 24-hour production — three times normal peace-time use.

To get the most out of your Century Motors, to assure longest, most economical operating life, ask your Century Application and Service Engineer for copies of these new Bulletins, or write direct today.

CENTURY ELECTRIC COMPANY
1806 Pine Street — St. Louis, Missouri

One of the Largest EXCLUSIVE Motor and Generator Manufacturers in the World. — Offices and Stock Points in Principal Cities.

Whenever Possible— Order Standard Motors

Constant speed, continuous duty, open rated 40° C. sleeve bearing, 60 cycle, 3-phase motors are produced in larger quantities than other types and therefore can usually be shipped faster.

300

CENTURY ELECTRIC COMPANY—1806 Pine Street - St. Louis, Mo.

Please send me "Installation—Care—Adjustment" booklets on the following types of Century Motors:

- ☐ Split Phase
- ☐ Repulsion Start Induction
- ☐ Capacitor
- ☐ Squirrel Cage
- ☐ Direct Current Motors
- ☐ Generators—Alternating Current
- ☐ Generators—Direct Current

Name.....

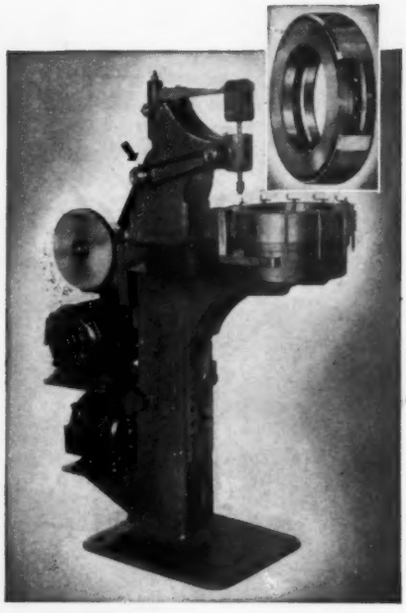
Company.....

Address.....

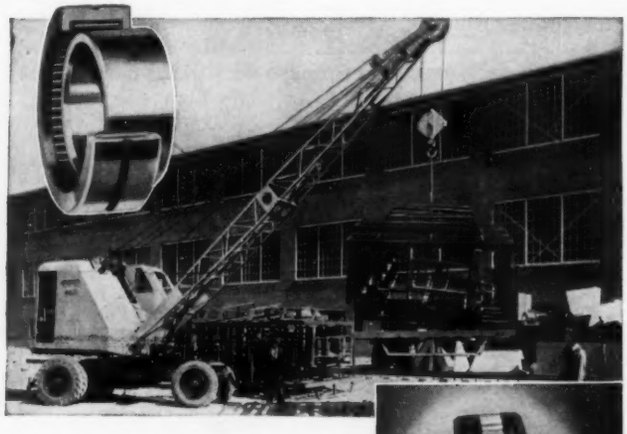
City..... State.....

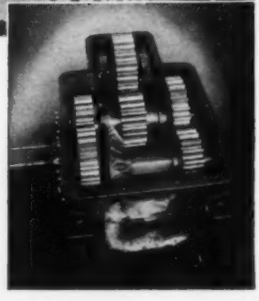
IN THE NEWS
WITH BANTAM BEARINGS

STRIKING POWER! Somewhere in the Pacific, U.S. Aircraft Carriers are seeking the enemy, looking for the chance to "dish-it-out." Back in South Bend, Indiana, other men and women—fathers, uncles, sisters, friends of the boys on the fighting fronts—are "dishing-it-out" too. That's why everyone of us at Bantam is proud of our third award of merit, the Army-Navy E flag with Two Stars. We're proud too, to have Bantam Bearings serving on nearly every type of fighting ship in the U. S. Navy.

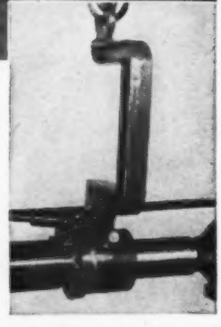


1800 TIMES PER HOUR *a thrust load* is exerted on this Rotary Hammer-type Riveter designed and built by The Grant Mfg. & Machine Co. Bantam Ball Thrust Bearings are used to carry the thrust load between the mainshaft bearing and inner clutch plate as well as the thrust of the mainshaft at point shown in the photo between the spindle pulley and the frame. Because Bantam's line includes all major types of anti-friction bearings Bantam's engineers are in a position to give experienced help and counsel in the design and selection of bearings for any type of job.





THIS SIX-TON "MOBILCRANE" does the job whenever and *wherever* needed. Built by the Osgood Company it operates and travels on a single power unit. In the design of the wheel drive power transmission, shown in close-up, Bantam Quill Bearings support one end of the transmission shafts which operate at 290 to 660 R.P.M. under heavy load—especially when operating in low gear. This interesting application utilizes the compact design and high capacity of Bantam's Quill Bearing. Additional information will be found in our Catalog. Write for your copy of Bulletin D-104.



SWING IT! For grinding large castings, take grinder to the job. That is an outstanding advantage of the swing frame grinder manufactured by the Vonnegut Moulder Corporation. And the "swing frame" (see inset) which holds the grinder chassis turns on a Bantam Quill Bearing to insure freedom of movement and ease of control in manual operation. This is another application where Bantam Quill Bearings are helping industry-at-war "beat the promise."

IF YOU'RE IN WAR WORK and need anti-friction bearings for any type of job TURN TO BANTAM. The Bantam line includes every major type of bearing—straight roller, tapered roller, needle and ball. Our engineers will be glad to work with yours in meeting today's needs and planning tomorrow's designs. Call us if we may be of help on any type of anti-friction bearing problem.

BANTAM BEARINGS

STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL

BANTAM BEARINGS CORPORATION • SOUTH BEND • INDIANA

Large box type Cyclone for aluminum and magnesium heat treatment.

Small box type Cyclone for tempering tools and dies or other work that is handled individually.

Large vertical type Cyclone for production tempering. Its accuracy of heating and control also makes it ideal for aluminum and magnesium heat treatment.

Small vertical type Cyclone Furnace for heat treating small parts. Note basket in lower right hand corner.

THIS IS ABOUT THE SIZE OF IT!

SPECIFY STANDARD SIZES when ordering heat treating equipment. Valuable time is saved because drawings are available and all engineering has been completed. Man hours are saved by the elimination of special work in both engineering and the shop. And heat treating furnaces are sped to their destination to do their chosen work.

The dimensions listed below represent standard sizes of both vertical type and box type Lindberg Cyclone Furnaces. Each of these furnaces has been engineered and built and installed in the field.

The sizes embrace a range wide enough to handle practically any heat treating job for temperatures up to 1250°F.

LINDBERG VERTICAL TYPE CYCLONE *FUEL FIRED*

Utilizes the famous Lindberg 100% forced convection heating principle, available in both fuel fired and electrically heated units. Work is handled in baskets or on fixtures for accurate, uniform, low-cost tempering and precision heat treatment of aluminum and magnesium castings and forgings. Temperatures from 250°F. to 1250°F.

Dia.	Depth	Dia.	Depth	Dia.	Depth	Dia.	Depth	Dia.	Depth	Dia.	Depth
12″	16″	22″	30″	25″	40″	28″	60″	38″	30″	48″	38″
12″	100″	22″	36″	25″	48″	28″	72″	38″	36″	48″	48″
16″	20″	22″	38″	25″	60″	33″	28″	38″	48″	48″	60″
16″	22″	22″	48″	25″	160″	33″	36″	38″	60″	48″	78″
16″	26″	22″	60″	28″	28″	33″	40″	38″	72″	60″	72″
16″	28″	22″	72″	28″	36″	33″	48″	38″	84″	72″	24″
16″	32″	25″	20″	28″	42″	33″	60″	43″	48″	74″	72″
16″	36″	25″	30″	28″	48″	33″	72″	43″	54″	74″	86″
22″	26″	25″	36″	28″	50″	38″	28″	48″	28″	100″	44″

ELECTRICALLY HEATED

Dia.	Depth	Dia.	Depth	Dia.	Depth	Dia.	Depth	Dia.	Depth	Dia.	Depth
8″	10″	16″	26″	22″	80″	25″	66″	33″	120″	48″	36″
8″	12″	16″	28″	22″	100″	28″	28″	38″	36″	48″	60″
10″	14″	16″	32″	25″	20″	28″	36″	38″	48″	48″	72″
10″	20″	16″	48″	25″	30″	28″	48″	38″	60″	48″	84″
12″	16″	22″	26″	25″	36″	28″	54″	38″	72″	48″	96″
12″	18″	22″	36″	25″	40″	28″	60″	38″	84″	60″	60″
12″	20″	22″	48″	25″	42″	28″	72″	38″	120″	60″	72″
16″	20″	22″	60″	25″	48″	28″	84″	43″	42″	60″	84″
16″	24″	22″	72″	25″	60″	33″	36″	43″	48″	60″	93″

LINDBERG BOX TYPE CYCLONE *FUEL FIRED*

Is also heated by 100% forced convection and is also available in both fuel fired and electrically heated units. Recommended for tempering tools or dies or other work that is handled individually. Its heating accuracy and control make the box type Cyclone ideal for heat treating aluminum and magnesium castings, stampings and forgings. Temperatures from 250°F. to 1250°F.

W.	D.	H.	W.	D.	H.	W.	D.	H.	W.	D.	H.	W.	D.	H.
12″	16″	18″	24″	36″	18″	30″	72″	24″	36″	72″	36″	60″	96″	42″
15″	24″	18″	24″	48″	18″	36″	22″	24″	36″	92″	24″	72″	12′	42″
17″	24″	18″	24″	24″	20″	36″	36″	24″	42″	72″	36″	—	—	—
18″	36″	18″	30″	48″	40″	36″	54″	30″	48″	12′	60″	—	—	—
24″	24″	18″	30″	48″	48″	36″	72″	30″	54″	72″	36″	—	—	—

ELECTRICALLY HEATED

W.	D.	H.	W.	D.	H.	W.	D.	H.	W.	D.	H.	W.	D.	H.
12″	16″	18″	24″	24″	18″	36″	72″	24″	48″	72″	36″	60″	60″	42″
12″	12″	10″	24″	36″	18″	40″	96″	24″	48″	72″	48″	60″	10′	42″
15″	24″	18″	24″	36″	30″	42″	16′	36″	48″	72″	60″	60″	10′	60″
15″	24″	24″	24″	48″	18″	42″	16′	66″	48″	96″	36″	60″	16′	60″
15″	30″	18″	28″	28″	36″	42″	72″	36″	48″	10′	72″	66″	15′	66″
15″	48″	18″	30″	30″	24″	42″	84″	42″	48″	12′	72″	66″	16′	76″
18″	36″	18″	33″	34″	30″	42″	14′	36″	48″	16′	72″	66″	25′	76″
20″	24″	18″	36″	36″	24″	48″	60″	30″	48″	18′	72″	72″	96″	84″
20″	30″	18″	36″	48″	24″	48″	66″	48″	48″	22′	66″	72″	12′	42″
20″	36″	18″	36″	54″	30″	48″	72″	30″	52″	84″	20″	84″	96″	72″

LINDBERG ENGINEERING COMPANY

2445 WEST HUBBARD STREET • CHICAGO

HYDRYZING FOR SCALE-FREE AND DECARB-FREE HARDENING

LINDBERG FURNACES

SUPER-CYCLONE FOR HARDENING, NORMALIZING, ANNEALING, TEMPERING, NITRIDING

"Commercial" ANNULAR BALL BEARINGS

EFFICIENCY
•
ACCURACY
•
ENDURANCE

•

USED IN HUNDREDS OF DIFFERENT PRODUCTS

•

WE supply ball bearings for every industrial purpose standard types, or bearings designed for unusual installations.

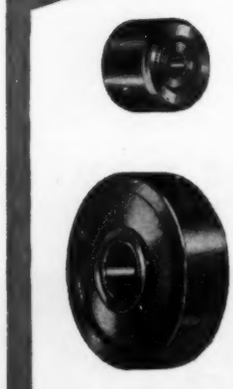
SCHATZ **"Commercial"** Bearings are made from high-grade steels, carefully heat-treated. They have the capacity, strength and endurance essential to long bearing life and efficient service.

On this page, we illustrate **"Commercial"** bearings of unusual design—a few of hundreds of different types manufactured by us. These illustrations convey some idea of our skill and ability in solving intricate ball bearing problems.

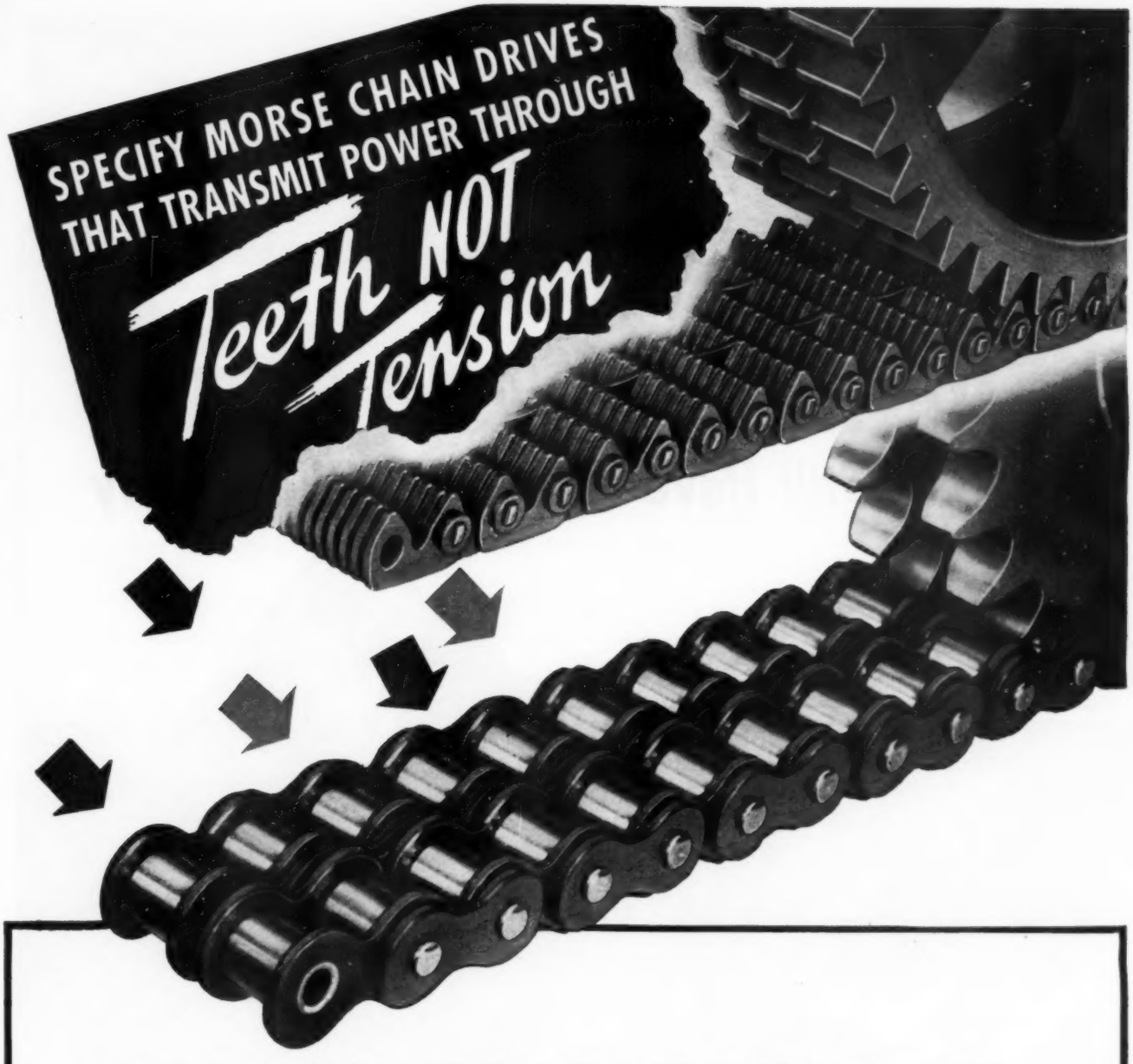
•

ENGINEERS AND MANUFACTURERS WHO DESIRE FURTHER INFORMATION REGARDING SCHATZ **"Commercial"** BEARINGS ARE REQUESTED TO WRITE FOR LATEST CATALOG.

•



THE SCHATZ MANUFACTURING CO.
U. S. A.
REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower • Chicago: 902 S. Wabash Ave.
Cleveland: 402 Swetland Bldg. • Los Angeles: 5410 Wilshire Blvd.



POWER transmitted along slipping, inefficient drives rapidly becomes wasteful —causes undue expense and decreases machine capacity.

With the Morse Chain Drive principle—"Teeth Not Tension"—there is no chance for slip or power waste. All the power is turned into productive war action at practically 100% efficiency. Every Morse Drive is a completely engineered power transmission unit so selected and designed as to render unfailing service in the severest of conditions. There is no need for constant adjustment, inspection—Morse Drives operate for years requiring hardly any maintenance. To keep war production at maximum, specify Morse Chain Drives—your local Morse Drive Engineer will assist you.

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA N. Y. DIVISION BORG-WARNER CORP

When You Use Smaller Motors

You Can Still Have Your MARGIN of Safety

. . . use motors with Klixon Protectors

When using smaller motors, to conserve vital materials for your government, you don't have to worry about burnouts *if your motors have built-in Klixon Protectors.* For if a motor has a built-in Klixon Protector, you can run at peak capacity with safety. You can carry overloads safely. But the instant you overload it too much and it gets too hot, the Klixon Protector automatically cuts the motor off the line, thereby preventing damage or a complete burnout.

And while speaking of savings, just think of how much these built-in Klixon Protectors actually do save—the vital materials that go up in smoke when a motor burns out; the cost, time and materials necessary for rewindings; the lost production of idle machines; and the delay and red tape in getting motor replacements.

When buying motors—A. C. all sizes and D. C. up to 30 volts—insist on built-in Klixon Protectors.

Spencer Thermostat Co., 1512 Forest St., Attleboro, Mass.

KLIXON

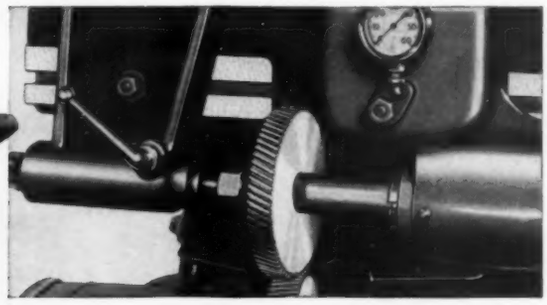
TRADE MARK REG. U.S. PAT. OFF.

Correct Heat Treat Distortion and Gear Tooth Roughness by

RED RING LAPPING

If lapping is one of the processes used in your gear production, you can save time and cost with a Red Ring Lapping Machine. Its outstanding features are:

1. Minimizes rejections by correcting heat treat distortion and eliminates gear noise.
2. Applicable to spur and helical gears, cluster and shoulder gears.
3. Extremely fast—one minute for a 4" gear with 1" face when reasonably well cut and heat treated.
4. Provides for either Cramp or Power Tail stock lapping processes.
5. Fully adjustable automatic cycle under hydraulic and electrical control—operator need have no special skill.
6. High production laps—lap life 1500 to 3000 units when recut twice.
7. May be used on high or low involute teeth and also on the Elliptoid Tooth Form.



Write for descriptive literature.

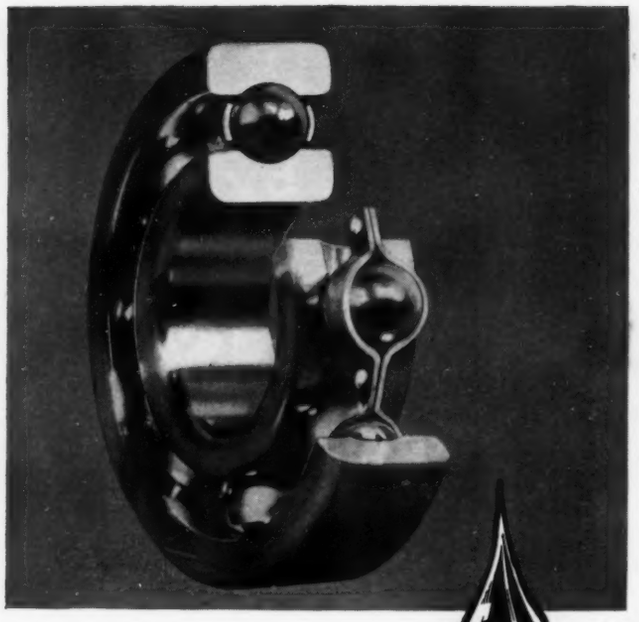
SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN · DETROIT, MICH.



Longer Life for Your Bearings

THROUGH PROPER LUBRICATION

PROPER lubrication can greatly lengthen bearing life. In lubricating, avoid "too much . . . too soon" . . . as well as "too little . . . too late." You'll obtain longer service from your sturdy BCA Ball Bearings . . . which are now essential war equipment . . . if you observe the precautions below. BEARINGS COMPANY OF AMERICA, LANCASTER, PENNSYLVANIA.

1. Use only neutral mineral lubricants.

2. When lubricating with grease, it is not advisable to have the housing more than one-half to two-thirds full. Too much grease may cause generation of heat faster than it can be dissipated by the surrounding housing.

3. While greasing, vent the grease chamber of housings that have shaft and bearing seals. Otherwise, excessive pressure may cause the destruction or blowing out of the seal.

4. When lubricating with oil, keep only enough in the housing so that the lowest ball dips in to one-half its diameter.

STANDARDIZE ON STANDARD SIZES

BCA

RADIAL • ANGULAR CONTACT • THRUST

BALL BEARINGS

ONE OF THE BEST ANSWERS TO ONE OF TODAY'S MOST PRESSING PROBLEMS:

How to get

MORE PRODUCTION from OLD MACHINES

Equip your machines with TANNATE Leather Belting! . . .

This is advice of Tannate users who have carefully compared belt performances and report "continuous output at lower unit cost", "increased machine speeds, even at peak loads", "extremely long service life, with fewer interruptions and with minimum maintenance expense".

To get these results, Tannate belts are specially tanned. This gives each belt unusual strength, firm pulley grip, and resistance to stretch. And, its "Watershed" treatment makes Tannate resistant to water, machine oils and many chemicals.

Thus, even under severe operating conditions, Tannate grips tightly, pulls steadily, runs smoothly and gets peak production from machines.

Why not give Tannate a trial in your plant?

—Established 1702—

J. E. RHOADS & SONS

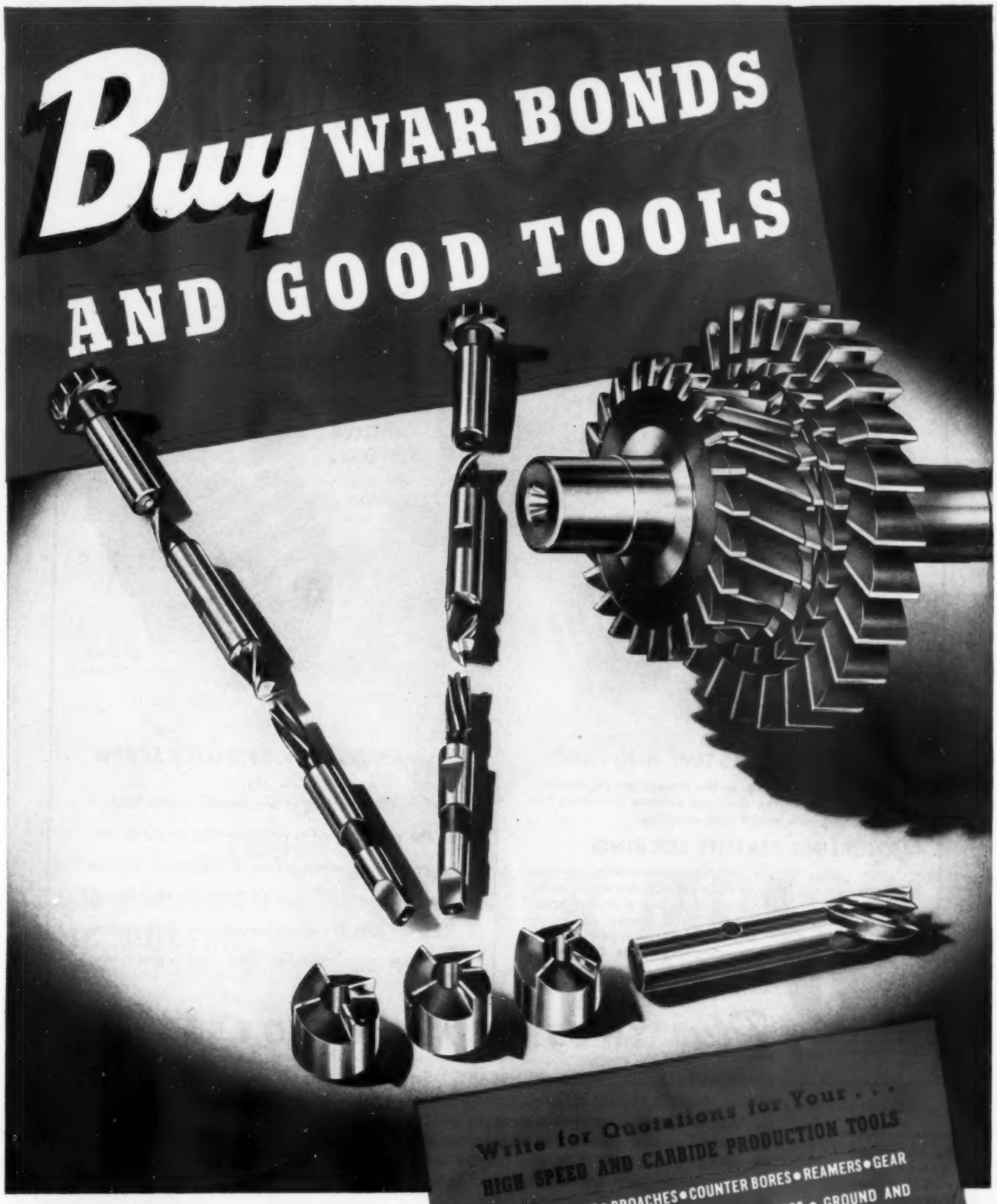
35 North 6th Street Philadelphia, Pennsylvania

NEW YORK • CHICAGO • ATLANTA • CLEVELAND

STEP UP PRODUCTION with

RHOADS *Tannate* WATERSHED LEATHER BELTING

AT THE POWER SHOW-BOOTH 309


Buy WAR BONDS
AND GOOD TOOLS
Write for Quotations for Your . . .
HIGH SPEED AND CARBIDE PRODUCTION TOOLS
MILLING CUTTERS • BROACHES • COUNTER BORES • REAMERS • GEAR CUTTERS • UNGROUND GEAR AND SPLINE HOBS • GROUND AND UNGROUND MULTIPLE THREAD MILLING CUTTERS • GROUND FLAT, DOVETAIL AND CIRCULAR FORM TOOLS AND SPECIAL CARBIDE TOOLS

CARBIDE

TOOL COMPANY
OF CHICAGO

816 NORTH KOSTNER AVENUE, CHICAGO, ILLINOIS

KNURLING OF UNBRAKO SOCKET SCREWS Gives You THESE EXCLUSIVE ADVANTAGES

KNURLED SOCKET HEAD CAP SCREW

SELF-LOCKING HOLLOW SET SCREW *with Knurled Points*

Pat'd and Patents Pending

KNURLING SAVES TIME AND LABOR

by preventing slipping, so the fingers can be used to best advantage. The firm grip enables mechanics to turn screws with speed and accuracy.

KNURLING PERMITS LOCKING

Showing locker in screw and locking tool

After countersinking, a few smart blows with a special locking-tool, having a circular edge and pilot in center, displaces enough metal to engage knurls and lock screw. Screw can be backed out and used over and over.

KNURLED POINTS LOCK SCREW

The knurling is so cleverly done that—on the principle of a ratchet—the point makes no resistance when screw is *tightened*, but as soon as vibration tries to loosen it, the knurls "dig in" and positively prevent it. Screws can be taken out with a key and used repeatedly.

Plus THESE ADVANTAGES

UNBELIEVABLE STRENGTH—"UNBRAKO" Screws register an ultimate tensile strength of 289,200 lbs. per sq. inch.

METAL SAVING—The great strength of "UNBRAKO" Screws permit the use of smaller and fewer screws. Because the key operates within the socket, "UNBRAKO" Screws can be used in the closest of quarters so designs can be more compact and lighter.

CLOSE TOLERANCE—"UNBRAKO" Screws are precision made.

DELIVERIES—better than average.

SIZES—from No. 4 to 1½" diameter.

The KNURLING of Socket Screws originated with "Unbrako" years ago.

Send for a copy of the "UNBRAKO" Screw Catalog.

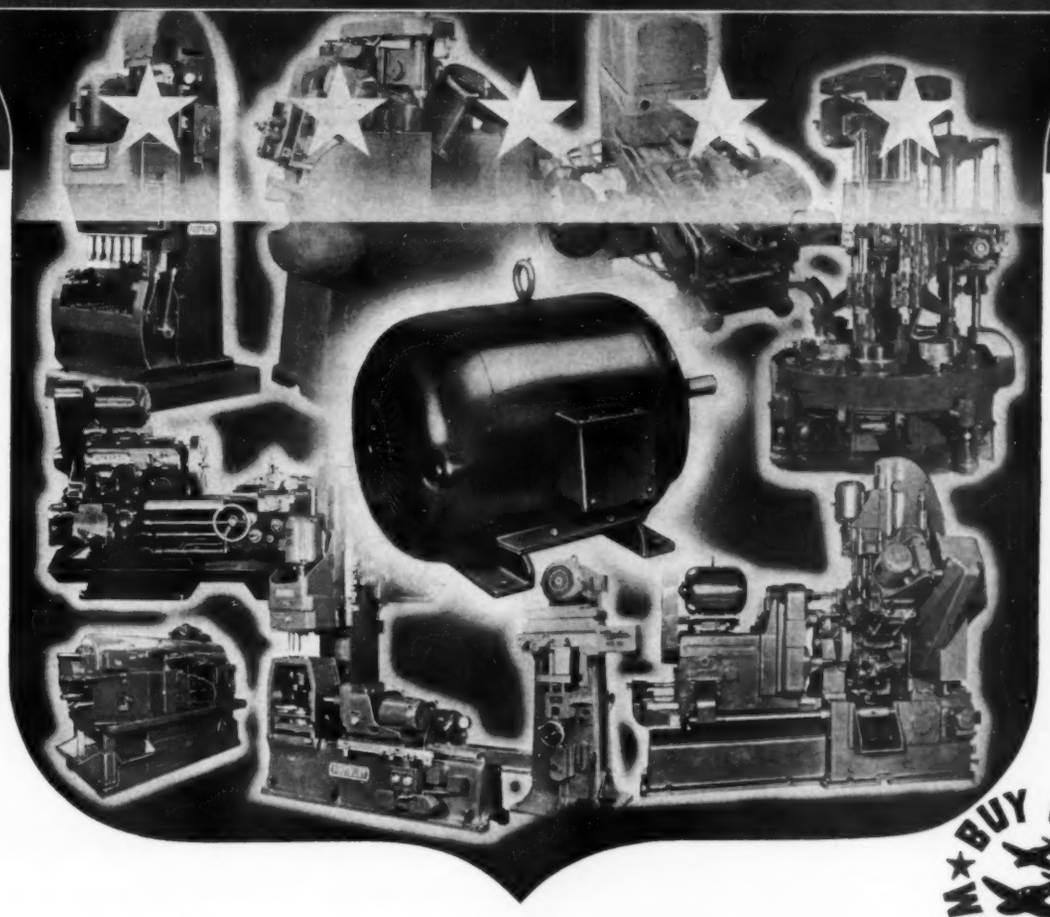
STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 4

BRANCHES

BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

Keep War Production Schedules on Time



BUY U.S. WAR BONDS

Use WAGNER MOTORS On Your Machine Tools

SEND FOR THIS FREE BULLETIN

Bulletin MU-182 on Wagner Polyphase Motors contains complete technical data and information that every user of machine tools should have. Write for your FREE copy today.

The high efficiency and dependability of Wagner totally-enclosed fan-cooled motors make them the choice of users of all types of machine tools. They reduce maintenance costs by giving longer service under the most severe operating conditions.

Here are a few of the reasons why Wagner CP motors are ideal for all types of machine tools —

1. TWO FRAMES — The inner frame prevents the entrance of metal dust, chips or cutting oils. The outer frame guides a strong cooling draft over the motor.
2. EXACT ELECTRICAL CHARACTERISTICS — Built in several distinct electrical types with varying torque and current characteristics required by the various types of machine tools.
3. PRECISION CONSTRUCTION — Dynamically balanced rotor, and all mechanical parts accurately machined to close tolerances to assure smooth operation.

Cut your motor maintenance and keep production schedules on time by specifying Wagner CP motors.

M43-28

Wagner Electric Corporation

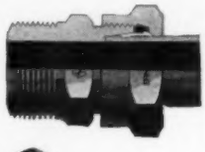
6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

MOTORS • TRANSFORMERS • FANS • BRAKES

Speed Production with... WEATHERHEAD FITTINGS AND HOSE

WEATHERHEAD products speed production in *two* ways:—first, by ease and reduced time of installation through elimination of needless operations; second, because they are engineered not only for performance but also for mass production to provide the increasing output so essential today.

ERMETO SAFETY FITTINGS—Ermeto speeds production by eliminating flaring, threading, welding, or soldering. Provides leak-proof connections on tubes of any metal. Withstands high pressures and excessive vibration. *Holds up beyond the burst strength of the tube itself.* Easily connected or disconnected.



BRASS TUBE FITTINGS—Complete line of tube service parts and fittings for every purpose. Inverted, S. A. E., and compression types with square finish to simplify installation.

FLEXIBLE HOSE ASSEMBLIES—Non-metallic flexible hose for automotive, aviation and machine uses. Oil-proof—gasoline-proof, Weatherhead complete hose assemblies with fittings attached answer the need where high pressures are involved.

Weatherhead also provides low pressure hose in any length with necessary fittings.

PACKLESS VALVES—Advanced design, positive and dependable; simple, with a minimum of working parts; leak-proof, quick-acting, sturdy. Low overall height; natural grip hand-wheel; full capacity openings; ideal for fuel lines.

Tell us the Weatherhead products in which you are interested and we'll send complete details.

THE WEATHERHEAD CO., CLEVELAND, OHIO

WEATHERHEAD

TUBE FITTINGS • FLEXIBLE HOSE • VALVES • DRAIN COCKS
AVIATION, AUTOMOTIVE AND REFRIGERATION SPECIALTIES

PLEDGED to uphold the QUALITY

Whether of machine tools, tanks, planes or ships, "Allens" preserve the UNITY of each assembly. They hold parts together *under fire!* They support the quality of *your* war goods by maintaining their own.

Our speed has been upped in all operations; time has been cut without cutting *essentials.* Shortages of critical materials have been met without impairing the standard of STRENGTH you've identified with these hollow screws.

Thirty-two years of product-integrity are Allen's pledge that Quality *will be* upheld. The record is promise of quality *more* than held, — continually to be improved. The Allen Manufacturing Company, Hartford, Connecticut.

Order only through your local Allen Distributor — the man who gets you the goods to the LIMIT of the supply!

ALLENS

GEROTOR
PRONOUNCED "JER-O-TOR"
HYDRAULIC PUMPS
LIQUID PUMPS
HYDRAULIC MOTORS
SUPERCHARGED AIRCRAFT– NICHOLS "GEROTOR" EQUIPPED
QUIET MAY OIL BURNERS– MAY "GEROTOR" EQUIPPED
WAR PLANES– ECLIPSE "GEROTOR" EQUIPPED
ARMY TANKS– "LOGAN" "GEROTOR" EQUIPPED
U.S. NAVAL VESSELS– MAY "GEROTOR" EQUIPPED
CHRYSLER AUTOMOBILES–"GEROTOR" EQUIPPED
CHRYSLER BUILT SUPER-OILITE "GEROTOR" UNITS
GEROTOR MAY
Division of May Oil Burner Corp.
Baltimore, Md.

Metal Shapes—

THE SPEARHEAD OF VICTORY

HITLER GETS THE POINT

Innumerable shapes of metal, each made for its particular place and purpose, make up America's fighting equipment—the most formidable the world has ever known. RITCO is pledged to produce such parts as fast as its plant capacity permits and 108 years of Yankee ingenuity can devise. Our output soars reassuringly and augurs ill for the Axis.

SPECIAL BOLTS, NUTS AND STUDS
DROP FORGING AND DIE SINKING
SCREW MACHINE PRODUCTS
HEAT TREATING
SPRAYED METAL SERVICE

Estimates gladly submitted.
Send samples or blueprints.
Catalog on request.

RHODE ISLAND TOOL CO.

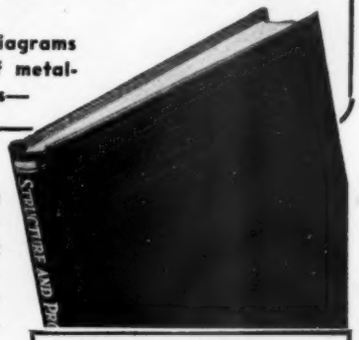
148 West River St., Providence, Rhode Island

Serving American Industry Since 1834

RITCO

How to understand . . .

- **the relationship between microstructures and properties of alloys—**
- **the application of phase diagrams in predicting effects—**
- **the use of phase diagrams in the control of metallurgical processes—**



The great increase in the use of a wide variety of alloys has brought an insistent demand for men who understand the applications of the principles of physical metallurgy to metallurgical processes. It is to provide this needed information as clearly and as simply as possible that this book has been prepared.

• The application of Phase Diagrams to the Interpretation and Control of Industrial Alloy Structures

Just Out! STRUCTURE AND PROPERTIES OF ALLOYS

By R. M. Brick
Instructor in Metallurgy,
Yale University

and Arthur Phillips
Professor Metallurgy,
Yale University

McGRAW-HILL PUBLICATIONS IN METALLURGY
227 pages, 6 x 9, 139 illustrations, $2.50

THIS text systematically correlates the alloy phrase diagrams and property data that are available in many books, with selected photographs of the internal alloy structures at appropriate magnifications (enlarged 10 to 1,000 times). Not only are the alloy structures obtained under equilibrium conditions of extremely slow cooling, as required to conform with the phase diagrams, shown and discussed, but the more important nonequilibrium structures characteristic of many industrial alloys are reproduced. These illustrate the typical departures from a stable state frequently encountered when cooling conditions are rapid, on the order of or faster than those of sand-casting or air-coolng.

Typical micrographs illustrating defective structures have been included to demonstrate the usefulness of the phase diagrams, correlated with a knowledge of the fundamental principles governing metal structures, in interpreting alloy failures.

All metal problems specifically related to internal structures are mentioned. About half of the space is devoted to nonferrous metals, chiefly aluminum and copper base alloys, and about half to steels and irons.

Read this list of contents—

1. Requisite Tools of the Metallurgist
2. Commercially Pure Metals
3. Cold-working and Annealing
4. Solid Solutions: Copper-Nickel and Other Useful Systems
5. Eutectic Alloys: Lead-Antimony System: Bearing Metals
6. Age-hardening: Casts and Wrought Aluminum Alloys
7. Phase Transformations: Copper-Zinc Alloys
8. Iron-Carbon Alloys: Normalized and Annealed Steels
9. Structural, Forged, and Cast Steels
10. Theory of Heat Treatment of Steels
11. Heat-treated Automotive and Tool Steels
12. Cast Irons
15. Monotectics: Sintered Metal Powders
14. Generalizations

FOR 10 DAYS' FREE EXAMINATION

MAIL THIS COUPON

McGraw-Hill Book Co., Inc., 330 West 42nd St., New York, N. Y.

Send me Brick and Phillips—Structure and Properties of Alloys for 10 days' examination on approval. In 10 days I will send you $2.50 plus few cents postage or return book postpaid. (Postage paid on cash orders.)

Name .....

Address .....

City and State .....

Position .....Company.....A. 12-10-42

Here is a *Portable* Coolant System
. . . with large volume, fully controlled flow

CONTROLLED FLOW from 10 to 1000 Gal. Per Hour

SPECIFICATIONS

CAPACITY:	MOTOR:
Pump, 1000 G.P.H.	¼ H.P.—
Tank, 40 Gals.	1725 R.P.M.
Size, 16x16x36 in.	Ball bearing.
PUMP:	**ST'D EQUIPMENT:**
Centrifugal; high stress casting; sleeve bearings.	Flow control valve. Handy motor switch.

The New Gray-Mills
HI-VOLUME
Centrifugal Pump

NOW you can have large coolant-volume and high flushing capacity in a *Portable Coolant System.* Wherever you want the advantages of using coolants you can have them—on *all* your equipment—for *all* metal working operations like: grinding, honing, milling, cutting, tapping and threading.

The new Gray-Mills Hi-Volume Centrifugal pump, scientifically designed, specifically to handle coolants, will easily deliver 1,000 gal. per hour, or a controlled flow of any volume down to 10 gal. per hour. Here are some other important features:—A relief valve eliminates pressure build-up—The tank is fitted with baffle plates, for forced settling of abrasives and chips, to keep the coolant clean—Rugged, simple construction assures long trouble-free service—Horsepower consumption is low because efficiency is high.

Write for complete details on the New Hi-Volume Centrifugal and learn how easily you can use it wherever you need large volume coolant flow.

If any of your production equipment is handicapped in not being able to handle coolants, the answer is a Gray-Mills Portable Coolant System. In addition to the Hi-Volume Centrifugal of 1,000 gal. per hour capacity there are other coolant system models with capacities from 50 to 165 gal. per hour. We have the answer to your coolant system problems!

OTHER MODELS

Heavy Duty "A" Series 75 to 165 G.P.H.

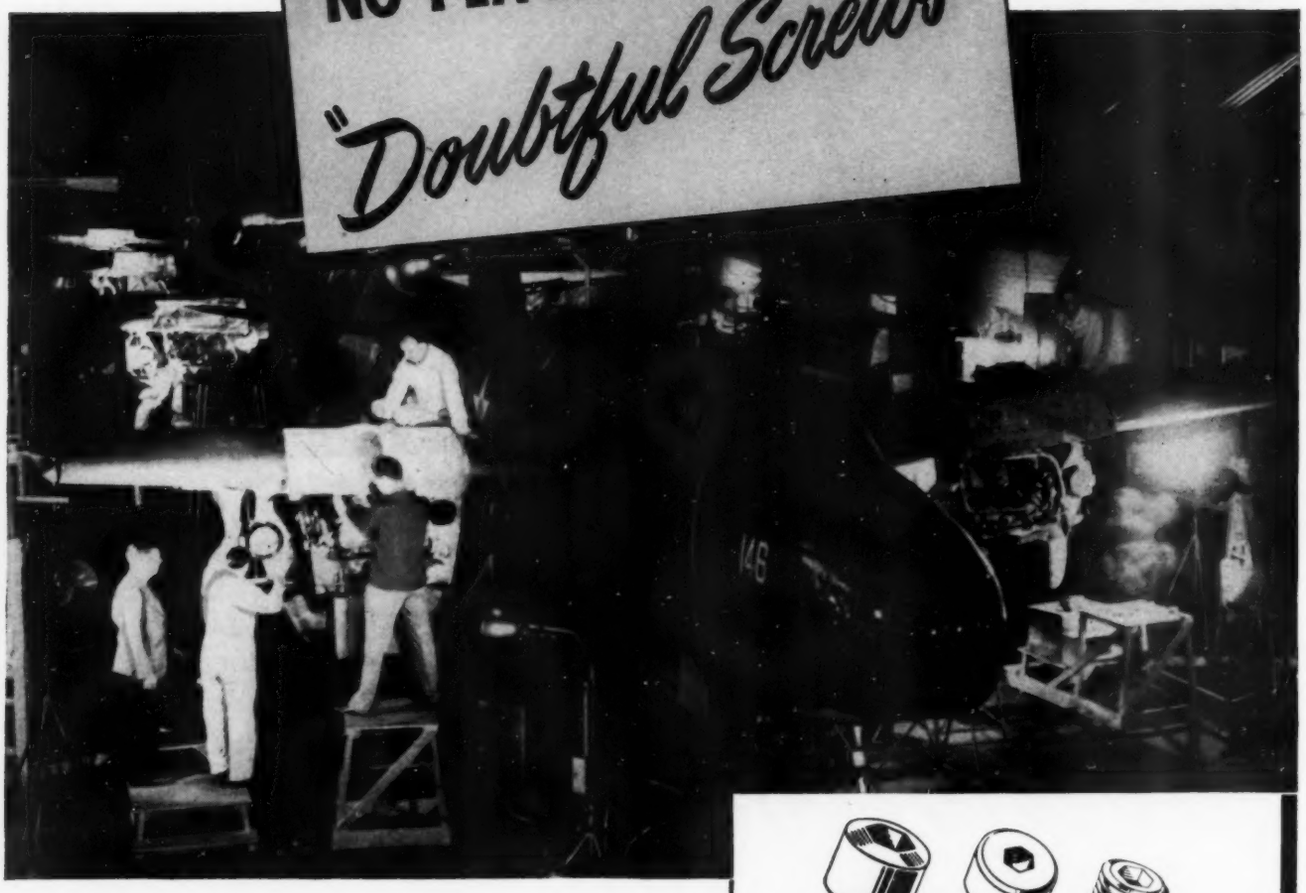
Standard 50 to 130 G.P.H.

GRAY-MILLS

COMPLETE PORTABLE COOLANT SYSTEMS
FLO-PAC COOLANTS, PANS AND FITTINGS

GRAY-MILLS CO., 227 W. Ontario St., Chicago, Ill.

NO PLACE FOR "Doubtful Screws"



—In Fighting Equipment that Must "Take It"!

Allies and enemies alike express amazement over the amount of punishment that American planes and combat cars will take. American engineers and production men have disproved any idea that they couldn't build fast and build well, too. While they've put on night shifts . . . speeded-up in a thousand ways . . . they've refused to take chances with "doubtful materials". And, in their insistence that every integral part must conform to rigid standards, lies the reason why Parker-Kalon Quality-Controlled Socket Screws are "on the preferred list" of so many makers of planes and engines, combat cars and trucks.

P-K Socket Screws have the extra dependability that severe service requires. "Doubtful screws" . . . screws that *look* all right but some of which fail to *work* right . . . are eliminated by the unequalled quality-control routine of the Parker-Kalon Laboratory. This assurance covers all physical and mechanical characteristics . . . yet P-K Screws cost no more. Parker-Kalon Corp., 194-196 Varick St., New York.

"Quality-Controlled" means . . .

Complete test and inspection covering; Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, height and concentricity; Socket shape, size, depth and centricality; and Thread fit.

PARKER-KALON

Quality-Controlled

SOCKET SCREWS

Give the Green Light to War Assemblies

YOUR DISTRIBUTOR

★

PERSONAL ATTENTION

When you want taps, you'll find your local THREADWELL distributor a breaker of bottlenecks — a man who has or can get the taps you want with a minimum of delay — or tell you the reason why — at once. Personal attention to your every problem is the keynote of the THREADWELL organization. Ask the THREADWELL distributor!

★

Sales Agents: Canada — Bridge Machinery Company, Montreal. England — Skylux, Ltd., London.

Threadwell

"TAPS OF DISTINCTION"

are made by the Threadwell Tap and Die Company, Greenfield, Massachusetts, U.S.A., founded in 1902.

MORE HOLDING POWER!

Where you need the greatest possible strength, Mac-it Hex Head Cap Screws will meet your requirements. They're accurately milled, with die-cut threads, and heat-treated for approximately 145,000 pounds per square inch.

For Hexagon Head Cap Screws That *Hold*

SPECIFY

Mac-its

THE STRONG, CARLISLE & HAMMOND COMPANY
1392 West Third St., Cleveland · Ohio

Threading Tool Holders—available with five different types of cutters. Any type may be ordered with holder and different types quickly interchanged. Made in straight and right hand offset.

Forming Tool Holders—made in straight and right-hand offset types—faster, smoother machining, free from cutter marks assured. Cutter cannot turn under heavy loads. Positively no side sway.

Cutting-Off Tool Holders—speed up cutting-off operations because spring feature permits faster feeds and heavier cuts without chatter or danger to cutting tool. Made in right-hand offset and straight types.

Faster Cutting Speeds and Heavier Cuts with Safety assured by

WILLARD *Spring* TOOL HOLDERS

These modern production aids are making valuable contributions toward winning production battles by eliminating chatter, protecting cutters against breakage and minimizing the chances of spoiled work. By making faster speeds and feeds safely possible, WILLARD SPRING TOOL HOLDERS are finding ever-widening acceptance in automotive, aircraft and other war production shops.

IMMEDIATELY AVAILABLE

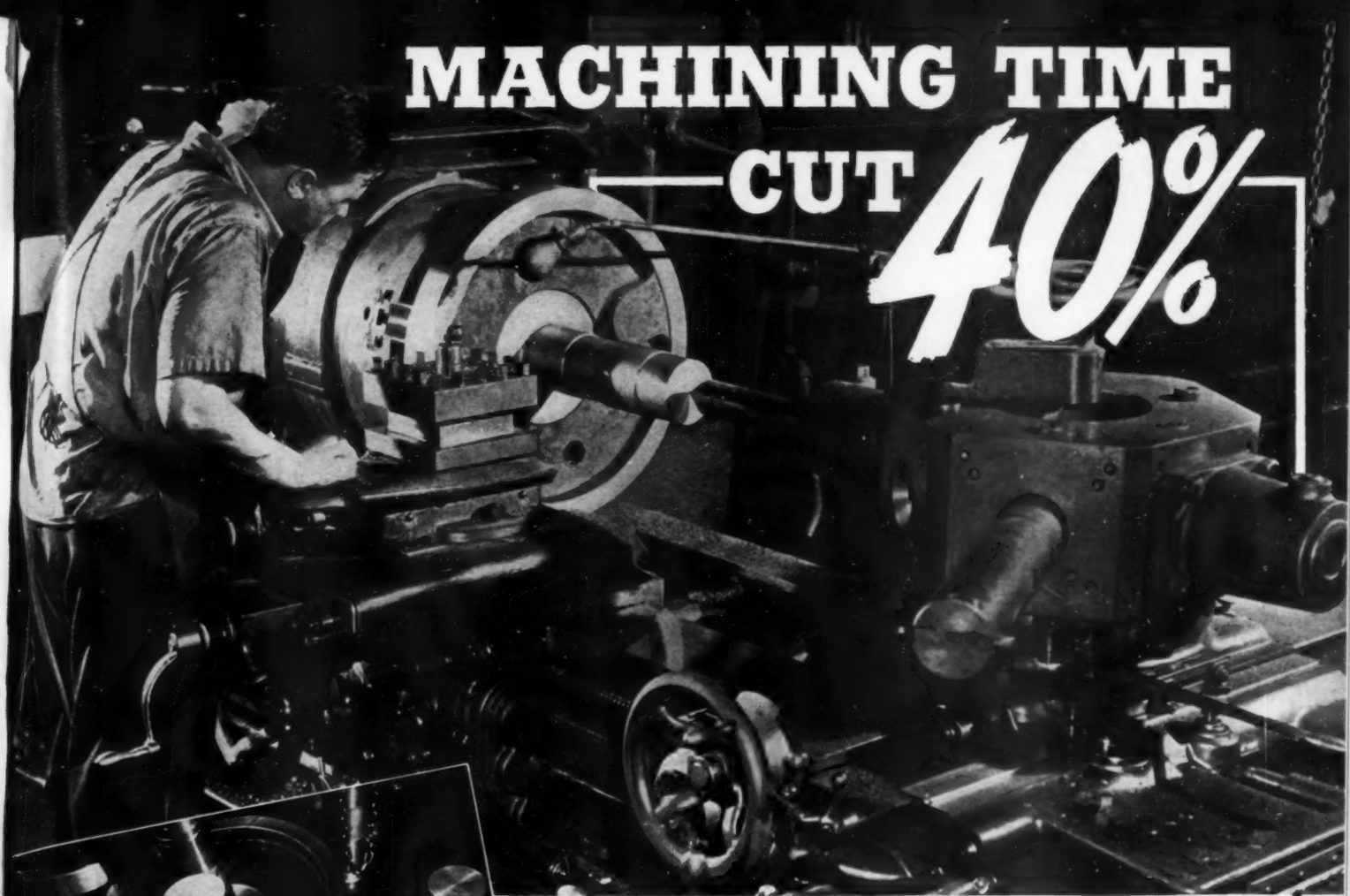
Investigate today by sending for Descriptive Circular of WILLARD TOOL HOLDERS for FORMING, THREADING and FORMING TOOLS, CUTTING-OFF TOOLS AND THREADING TOOLS. We guarantee prompt deliveries on a wide range of sizes.

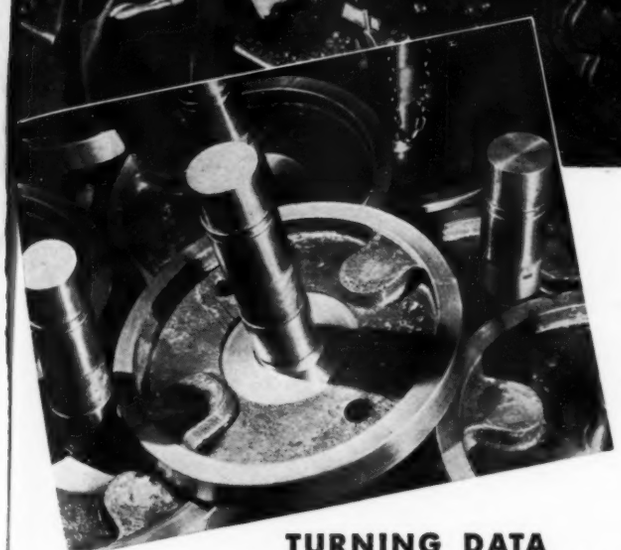
Product of **AUTO-ORDNANCE CORPORATION**

Thompson

1437 Railroad Ave., BRIDGEPORT, CONN.

MACHINING TIME —CUT 40%





TURNING DATA

MACHINE—Libby 4H Heavy Duty Turret Lathe.
SPECIAL EQUIPMENT—Compound Rest on the Cross Slide and Cross Feeding Hexagon Turret.
WORK—Turning Gate Plate and Gear Units up to 35" O. D.
MATERIAL—Cast Iron.
METHOD OF CHUCKING—4-Jaw Chuck.
MACHINING TIME—10 Hours approx.
SAVINGS—Approximately 40% faster than on an engine lathe.

NOTE: This machine is used to handle miscellaneous jobs made possible by the cross feeding hexagon turret which utilizes only simple, standard tools and single point boring bars.

FREE Write for catalog covering the extensive line of Libby Type H Heavy Duty Turret Lathes. Ask Libby engineers to make specific recommendations for your work. Write to Libby Division, 1126 West 21st Street, Indianapolis, Indiana.

...WITH A LIBBY HEAVY DUTY TURRET LATHE

A large Eastern equipment builder now machines gate plate and gear units 40% faster than was formerly possible on an engine lathe.

The large cast-iron parts are chucked in a 4-jaw chuck, and a heavy duty center in the turret is used to support the outer end of the work. The machine is equipped with a compound rest on the cross slide, and performs the miscellaneous turning, facing and grooving operations in about 10 hours, a saving of 40% in time.

This is typical of the way Libby Heavy Duty Turret Lathes are effecting savings and speeding production all over the country. They are greatly improved over machines of only a few years old, and are capable of removing metal up to 50% faster than these older machines. In addition, it is much easier to hold close tolerances on these new machines, even while taking extra heavy cuts.

International engineers are specialists in the machining of large heavy work. They will be glad to check over your present and future requirements, and make recommendations. Your request for their service is without obligation.

INTERNATIONAL MACHINE TOOL CORPORATION

FOSTER DIVISION, ELKHART, INDIANA · LIBBY DIVISION, INDIANAPOLIS, INDIANA

MAIN OFFICE AT ELKHART, INDIANA

FOSTER FASTERMATICS · LIBBY HEAVY DUTY TURRET LATHES · STANDARD TOOLS
SUPERFINISHING MACHINES · BARKER CHUCKS · UNIVERSAL RAM TYPE TURRET LATHES

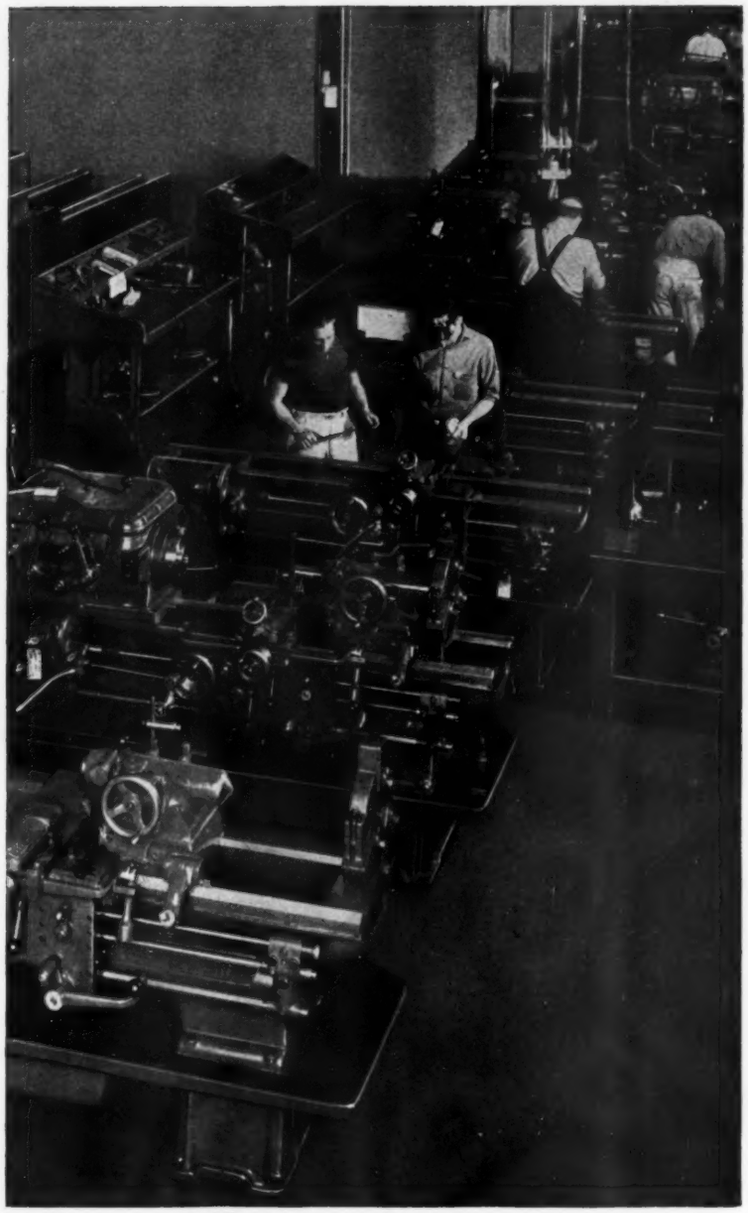
Lathes of the future--NOW!

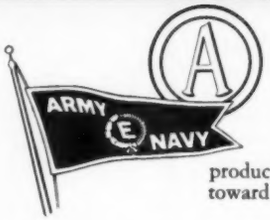
Every day more and more Axelson lathes are going into the battle of production throughout the United Nations, doing all types of turning jobs quickly and accurately.

Lathe production schedules that once seemed outstanding have been stepped up again and again to meet the demands of war.

Out of this stepped-up production has come an increase in know-how engineering skill to supplement Axelson's 25 years of lathe building experience. The constant industrial evolution towards improvement has been stepped up in direct proportion to production, so that today Axelson is not only building more lathes but better lathes.

Into every Axelson lathe goes the finest materials and the accurate craftsmanship that will keep them on the job 24 hours a day, seven days a week until Victory is won. And after its over Axelson lathes will be turning out the peace-time products of American Free Enterprize for many years to come. Axelson is truly building the lathes of the future—NOW!





The men and women of Axelson proudly wear their silver "E" pins expressing the Army and Navy appreciation for a job well done. The maintenance of high production levels is their pledge toward America's final victory.

AXELSON MANUFACTURING COMPANY

6160 Boyle Avenue (P. O. Box 98, Vernon Station), Los Angeles, California • 50 Church Street, New York City, New York
3844 Walsh Street, St. Louis, Missouri • 204 Munsey Building, Washington, D. C.

Before you buy any lathe investigate AXELSON

HOW AND WHY

WILLIAMS' TOOLS AID WAR PRODUCTION

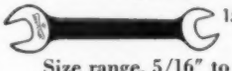
J. H. WILLIAMS & CO., *Drop-Forgings and Drop-Forged Tools*, BUFFALO, N. Y.

DATA ON WILLIAMS' "SUPERIOR" WRENCHES

● Since Williams' "Superior" (Carbon Steel) Wrenches provide exceptional strength with minimum use of critical materials, a review of standard available types is timely. "Superior" Wrenches are approximately twice as strong as earlier carbon steel wrenches of our manufacture. Comparative tests demonstrate that they average (throughout all patterns and sizes) 93% as strong as our corresponding alloy steel "Superrenches", which we feel are among the strongest wrenches ever manufactured commercially.

A description of the most generally used "Superior" wrench types follows. More detailed information is contained in Williams' Wrench Booklet, No. A-81, which will be mailed for the asking.

Engineers' Pattern



15° Angle, Double Head. For general service.

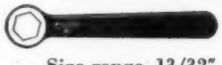
Size range, 5/16" to 5-3/8" openings. Also single head style, 3/16" to 7-5/8".

Check Nut or "Thin" Pattern

15° Angle, Double Head. For Check, Jam or Lock Nuts, etc.

Size range, 13/32" to 1-1/2" openings. Also single head style, 7/16" to 1-11/16".

Hex-Box, Regular Pattern



15° Angle, Single Head. For general service.

Size range, 13/32" to 4-5/8" opening. Larger sizes, from 3-3/8" to 4-5/8" opening, are also furnished with *striking face* on end of shorter handle.

Hex-Box, Heavy Pattern

15° Angle, Single Head. For heavy duty.

Size range, 1-1/4" to 3-1/8" opening. Also made with *striking face* on end of shorter handle throughout full size range.

Set Screw Pattern

22-1/2° Angle, Double Head. For Set Screws, Square Cap Screws & Nuts.

Size range, 3/16" to 1-1/8" opening. Also single head style, 3/16" to 1-1/8".

"S" Pattern

22-½° Angle, Double Head. For Standard Nuts and Cap Screws.

Size range, 5/16" to 2" opening.

Machine Pattern

Straight Opening. Dbl. Hd. Extra heavy for Planers, Milling Machines, Lathes, Drill Presses, etc.

Size range, 3/8" to 1-7/16" opening.

Tool Post Pattern

For Set Screws only.

For Nuts and Set Screws.

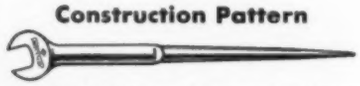
Nos. 554 to 557, for set screw sizes (both ends) 7/16" to 3/4".
Nos. 562B to 568D, openings 5/8" to 2". Same opening both ends.

Heavy "S" or Car Pattern

22½° Angle, Double Head. Long leverage wrenches primarily for railroad use.

Size range, 5/8" to 2-7/16" opening.

Construction Pattern



15° Angle. Straight handle. Deep opening for square nuts, and tapered handle for lining-up bolt holes.

Size range, 7/16" to 2" opening.

Structural Pattern

Straight opening. Offset handle. Deep opening for square nuts, tapered handle for lining-up bolt holes.

Size range, 7/16" to 2" opening.

Face Spanners

For general service.

Size range, 1" to 4" C to C of pins, in 1/4" multiples. Also Adjustable Face Spanners in 3 sizes with 2, 3 and 4" capacities.

Pin Spanners

For general service.

Size range, for circle diameters 1" to 6".

Hook Spanners

For Taper Nose Lathe Spindles and general service.

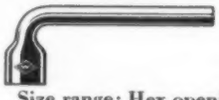
Size range, for circle diameters, 7-3/8", 9-1/4" and 12-1/2". Also Adjustable Hook Spanners in 3 sizes for circle diameters ranging from 3/4" to 4-3/4".

Pin Handle Sockets

With Hex or Square Opening for general service.

Size range: Hex openings 5/16" to 2-3/8". Square openings, 1/8" to 2".

Offset Sockets



With Hex or Square Opening for general service.

Size range: Hex openings, 5/16" to 2-3/8". Square openings, 1/8" to 2".

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
Headquarters
for over half a century of
DROP-FORGINGS and DROP-FORGED TOOLS

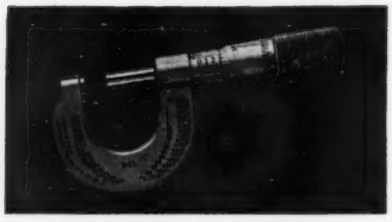
Sold by Leading Industrial Distributors Everywhere

SCHERR MACHINISTS' TOOL SPECIALTIES

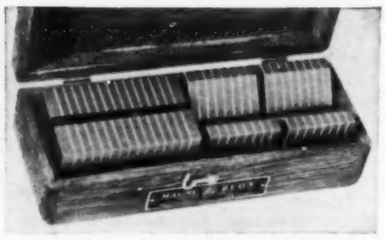
MACHINISTS TOOLS in a wide range of types for precision measuring of all kinds.

REED MICROMETERS assure lead accuracy over the full range of screw; easily read; sensitive; long-lived.

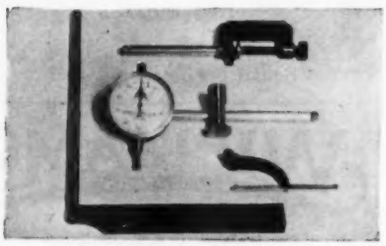
GRINDING ROOM SPECIALTIES



MAGNE-BLOX laminated magnetic parallels and V blocks are designed especially for holding work that cannot be placed directly on magnetic chuck; inexpensive; practical.



"LITTLE WONDER" RADIUS DRESSER —will dress convex or concave radii from 0 to 1" without removing wheel guard.



DIAL INDICATORS—fully guaranteed for accuracy; attachments available which extend the range of uses.

GS Two Lock Tool CHESTS provide quick availability of tools as needed

These sturdy tool chests are equipped with separate locks for the open top and for the lower drawer section. They are arranged so that only the tools actually needed are outside while all other tools are safely locked and protected in the drawers.

GS TOOL CHESTS are available in solid oak, leatherette and a new poplar, lightweight type. They are made in various sizes.

Illustrated above is our new oak Tool Chest #1120, size 20" x 9¼" x 16¾" with 11 drawers including upright drill drawer.

SPECIAL QUANTITY DISCOUNTS

In view of the fact that there are probably many new men in your shop who require tool chests, we are offering a special discount for GS Tool Chests ordered in quantity for delivery in your shop. The fact that GS Tool Chests tend to create orderliness in tool handling and storage so necessary for keeping production running smoothly makes it to your advantage to encourage the use of these strong, durable, convenient chests by your men.

GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.

WATCH YOUR

Speed AND *Feed!*

Tool Conservation Demands that the Rates be Right

When you are using properly designed and sharpened metal cutting tools, no factors of operating efficiency are more important than the selection of correct speeds and feed rates for each milling job.

Since proper selection is dependent on many variables, it is vital that *all* circumstances be considered. Such factors as the sharpness of the cutter, the proportions and depth of the cut to be made, the type and hardness of the work material, and the condition of the machine have their influence on the cutting operation.

Therefore, an intelligent analysis of cutting speeds and feeds on *each set-up* will be of great help in getting the most production and the longest life from your cutting tools.

ILLINOIS TOOL WORKS

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

2501 N. Keeler Avenue, Chicago, Illinois

In Canada: Canada, Illinois Tools, Ltd.
Toronto, Ontario

ILLINITE

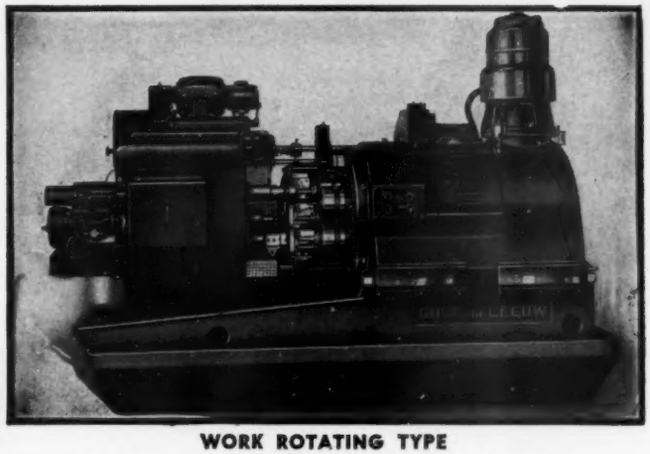
High Speed Production Tools

Hobs • Broaches • Shaper Cutters • Milling Cutters • Ground Form Tools • Special Tools

★ ★ ★

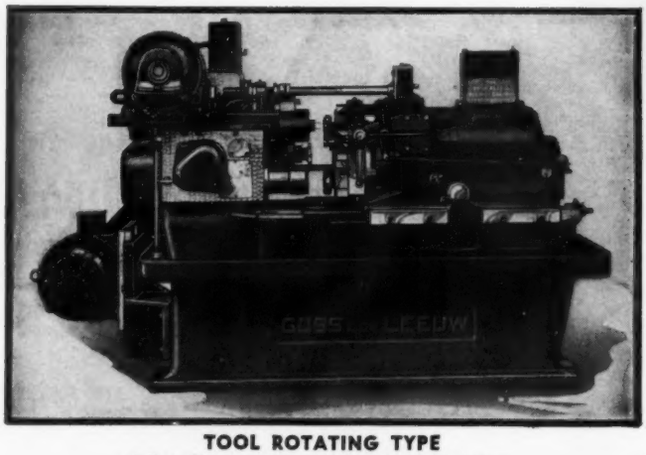
Gear Measuring Machines
Gear Measuring Blocks
Die Filing Machines

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES



WORK ROTATING TYPE

5 Spindles • 6 Spindles • 8 Spindles



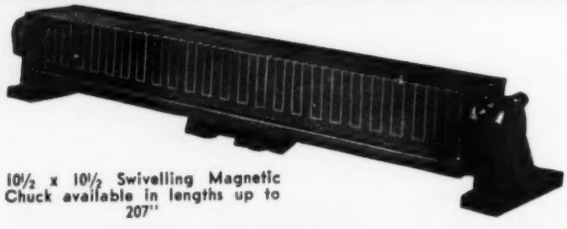
TOOL ROTATING TYPE

4 Spindles • 5 Chucking Positions

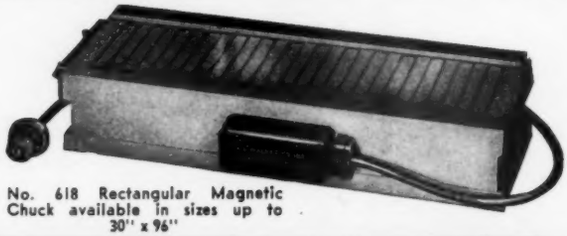
Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.



10½ x 10½ Swivelling Magnetic Chuck available in lengths up to 207"



No. 618 Rectangular Magnetic Chuck available in sizes up to 30" x 96"

Your every need can be met with

WALKER MAGNETIC CHUCKS

DEMAGNETIZERS

Send for a copy of Bulletin K7 giving complete information on Walker D.C. and A.C. Demagnetizers. These units —in 110 and 220 v.—are suitable for removing residual magnetism from a wide variety of work, are convenient and highly efficient.

Aside from the fact that Walker Magnetic Chucks are of tried and proved design and construction, the big advantage in coming to Walker for your needs is the fact that you can be certain that you will exactly meet your needs. Regardless of your requirement, there's a Walker to handle it.

The completeness of the Walker Magnetic Chuck line makes it possible for you to standardize on these well-known and widely accepted units. Every type of magnetic chuck is available in a wide range of standard sizes including Rectangular, Swiveling, Vertical Face and Rotary. Every design is modern, convenient, with maximum uniform magnetic strength over the entire surface.

Get all the details pertaining to sizes, types and construction by wiring today for a copy of Bulletin W4.

Also

Walker is prepared to furnish promptly and at reasonable price any special magnetic chuck that may be required for special service conditions. Outline your problem and ask us to submit details and quotation.

Style B Face Plate for Standard Rotary Type Chucks available in sizes up to 66" diam.

No. 410 Universal Swivelling Magnetic Chuck

O. S. WALKER CO. Inc., Worcester, Mass.

DIESEL ENGINE CRANKSHAFTS COMPLETELY MACHINED ON

WICKES UNIVERSAL LATHE

Here you see the big new powerful Wickes Model UH-60 Universal Crankshaft Lathe which machines Diesel crankshafts having main line bearings and crankpins up to 10" in diameter and strokes up to 14". This lathe is built in both single end drive for turning all main line bearings and double end drive for turning crankpins as well. • Equipped with independent hydraulic feeds and rapid traverse to both carriage and cross slide. • If you are interested in a lathe built expressly for stepping up the finishing operation on big Diesel cranks, write for further details about the Wickes Universal Crankshaft Lathe UH-60. • Other Wickes Lathes from 36" to 72" are available for machining gasoline engine, truck, tractor and airplane crankshafts.

WICKES LATHES

CUT COSTS · SPEED PRODUCTION

WICKES BROTHERS · SAGINAW MICHIGAN · EST 1854

Crankshaft Turning Equipment · Double End Boring Lathes · Heavy Duty Engine Lathes · Special Production Lathes · Blue Print Machines

IDEAL 4 WAYS TO Speed WAR PRODUCTION

Here are a few of the many IDEAL products which are helping to speed vital war production.

1 IDEAL LIVE CENTERS

Take Deeper Cuts At Higher Speeds

IDEAL Live Centers not only permit deeper cuts at higher speed, but carry heavier loads, because the IDEAL Live Center rotates with the work. Radial load carried by high precision ball bearings, thrust load absorbed by high precision taper roller bearing. All parts hardened and ground.

TRIPLE DUTY

3 Interchangeable Center Pieces. For all centered and uncentered work.

2 IDEAL MARKING TOOLS

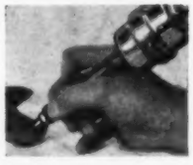
Prevent production delays due to theft, mistakes, confusion

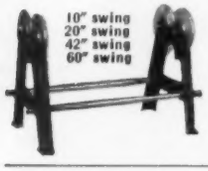
ELECTRIC MARKERS

Permanently mark all materials; glass, metals, ceramics. Used like a pencil. 7,200 cutting strokes per minute. Available with Diamond Point.

ELECTRIC ETCHERS

Permanently mark iron, steel and their alloys. New, "Machine Shop" model has 14 etching heats. Other models for fine or heavy etching.





3 IDEAL BALANCING WAYS

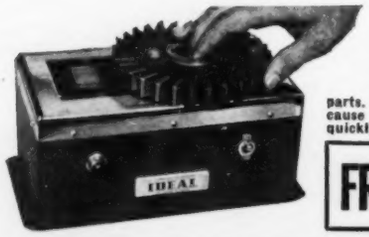
Speed up balancing of pulleys, fly-wheels, etc. No time wasted finding centers. No leveling or set-up required.

Powerful — Portable.

4 IDEAL DEMAGNETIZER

Keeps Tools Sharp Longer

Quickly demagnetizes work held in magnetic chucks, tools, drills, punches, dies, etc. Abrasive particles practically disappear after a single pass across the magnetic poles. For small tools or large parts. Demagnetized tools cut faster because they do not bind, heat and dull quickly.



FREE Machine Tool Accessory Catalog gives information on these and many other time-saving tools.

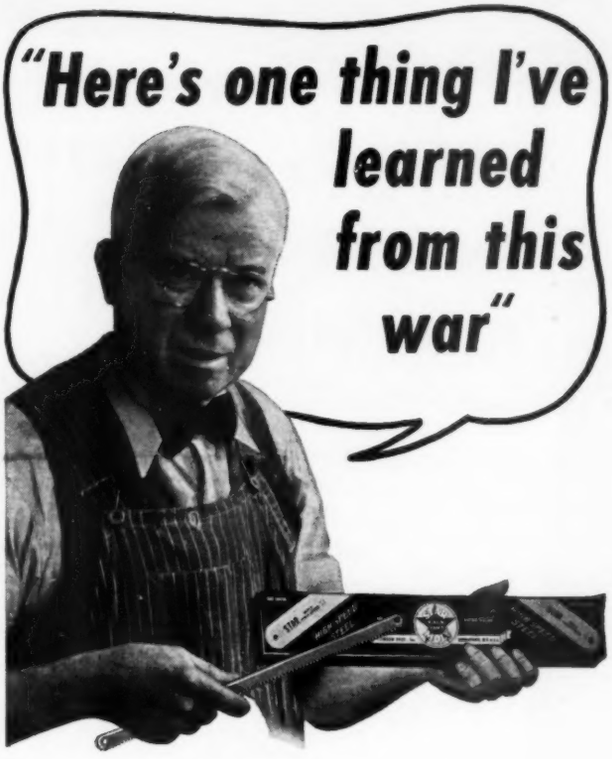
IDEAL COMMUTATOR DRESSER CO.

1057 PARK AVENUE SYCAMORE, ILLINOIS

SALES OFFICES IN ALL PRINCIPAL CITIES

In Canada: Irving Smith, Ltd., Montreal, Quebec

"Here's one thing I've learned from this war"



"I've found these STAR 'Moly'* High Speed Blades—hand *or* power—last just as long and cut even faster than other high speed blades they replace.

"Ten years ago, when Clemson brought out the first molybdenum alloy blade, it cost so much less that I thought it was just a 'cheap substitute'. It took the war to teach me I was wrong. Even after we've won this war, I'll be sticking to STAR 'Moly'* High Speed."

Today's STAR "Moly"* High Speed is far ahead in steel analysis and heat treatment. It's only logical that the company which developed the first molybdenum blade, and has been making them and improving them ever since, today makes the best—STAR "Moly"* High Speed, easy to recognize by its all-over metallic finish.

"TRAINEE TROUBLE"?

Then give those new apprentices this free 20-page STAR book of hack saw knowledge. It helps speed work, save blades. *Ask for* **"METAL CUTTING."**

CLEMSON BROS.

INCORPORATED

MIDDLETOWN, N. Y.

**T. M. Reg.—Blades bearing the name "Moly" are made only by Clemson Bros., Inc. and affiliated companies.*

3183

Which of these NEWEST *McGraw-Hill books on* SPECIAL PHASES OF AIRCRAFT WORK *can profit you the most?*

1. AIRCRAFT HANDBOOK

A workbook for those concerned with aircraft maintenance and others who need a detailed knowledge of airplane engines and accessories. Describes completely the constructional features of engines, how to install them, disassemble and assemble them, care for and adjust their parts, etc.—everything necessary to the intelligent performance of inspection, servicing and repair work. Contains first published details of the new Allison and the Rolls-Royce engines. New 5th edition, completely revised and up-to-date. By Fred Colvin, Editor Emeritus, *American Machinist*. 784 pages, 621 illustrations, 112 tables, $5.00.

2. AIRCRAFT INSPECTION

Here is abundant material to help you handle with authority any of the scores of inspections of modern aircraft production. Gives all the information needed for inspections that meet most rigid requirements, of quality, serviceability, and safety. Everything covered from the application of rivets, bolts, pins, and such items, to preflight and delivery inspections of the complete airplane. Inspections of fuel and oil systems, oxygen, heating and ventilating, and fire-extinguisher systems are covered. You are shown how to make final inspection of flight-control system, doors, hatches, and enclosures, and electrical installations. Four chapters give you completely the important power plant inspections. Etc. By E. E. Wissman. 268 pages, 89 illustrations, $3.00.

3. AIRCRAFT BLUEPRINTS AND HOW TO READ THEM

Here are simple, step-by-step instructions that speedily equip you to read prints in any modern aircraft plant. Book gives you the basic principles underlying all print reading and shows you clearly—with easy-to-follow instructions—how to read detail, assembly, and installation prints. Covers every type of aircraft drawing, includes specimen prints from nearly all the large aircraft firms, and meets print reading standards throughout the country. Includes actual prints from Boeing, Brewster, Consolidated, Curtiss-Wright, Douglass, Grumman, Lockheed, and Vought-Sikorsky. By C. Norcross, Major, U. S. Army Air Forces. 102 pages, 79 illustrations, only $1.75.

4. AIRCRAFT WELDING

Complete, practical introduction to modern aircraft welding, describing materials, preliminary preparation of pieces for welding, and details of the welding process. Clearly explains the difficulties likely to be encountered and how to solve them. In easy steps, the book presents the information you must know to qualify for a good-paying aircraft welding job. By L. S. Elzea, Supervisor of Welding, Division of Aircraft Training, Public Schools, Wichita, Kansas. 121 pages, illustrated, $2.00.

5. PRACTICAL AIRCRAFT SHEETMETAL WORK

Introduces you to all the essentials of aircraft sheetmetal work, including assembly, drilling and riveting, blueprint reading, and template development. Its how-to-do-it treatment takes you through all the steps necessary to attain proficiency. Developed in modern aircraft apprentice classes, the material in this book has been used successfully to train hundreds for payroll jobs in this field. By R. Frazer, Supervisor of Aircraft Training, Murray Corp. of America, and O. Berthiaume, Asst. Superintendent of Aircraft, Auburn Central Co. 194 pages, illustrated, $3.00.

6. MATHEMATICS FOR THE AVIATION TRADES

A manual for all who want to be aviation mechanics—giving just the mathematics needed on the job and a background of principles valuable to those seeking advancement. Reviews fundamentals of arithmetic, takes up the airplane and its wing, the mathematics of aircraft materials, and of engine work—treating each topic as an actual job, giving worked-out examples, and bringing in valuable related information. By J. Naidich, Chairman, Dept. of Mathematics, Manhattan High School of Aviation Trades. 271 pages, 324 illustrations, only $1.80.

7. INTRODUCTION TO AIRCRAFT DESIGN

This book gives engineers, draftsmen, and others a concise but complete view of the airplane as a design problem, for their aid in better understanding any phase of design work and its relation to the complete design. Structure of the airplane and its parts is covered from the standpoint of showing functions of the various elements, usual types and materials, factors affecting design, and the procedure of the design department or group. Fully covers the background important to the designer, from aircraft weight and stress problems to the work of contract administration and testing groups. By T. P. Faulconer, Director of Education, Consolidated Aircraft Corp. 273 pages, 32 illustrations, $2.75.

8. AIRCRAFT RIVETING

A complete, practical, easy-to-understand introduction to riveting for all who want to prepare quickly for any kind of riveting job in the aircraft industry. Covers the field in every aspect and contains an abundance of valuable, useful information that will prove to be of great help to the general aircraft mechanic. In simple language, the book develops your ability to handle tools and equipment, to do both hand and machine riveting, to use latest methods and machines. The material in this book—used successfully to train hundreds of men for jobs in aircraft building and repair work—covers everything you need to make progress in the field. By A. H. Nisita, Instructor, Aviation Mechanics and Riveting, Burgard Vocational High School. 165 pages, 261 illustrations, $2.50.

FOR 10 DAYS' FREE EXAMINATION OF THESE BOOKS JUST MAIL COUPON

McGraw-Hill Book Co., 330 West 42nd St., N. Y. C.

Send me the books checked below for 10 days' examination on approval. In 10 days I will pay for the books, plus few cents postage, or return them postpaid. (Postage paid on cash orders.)

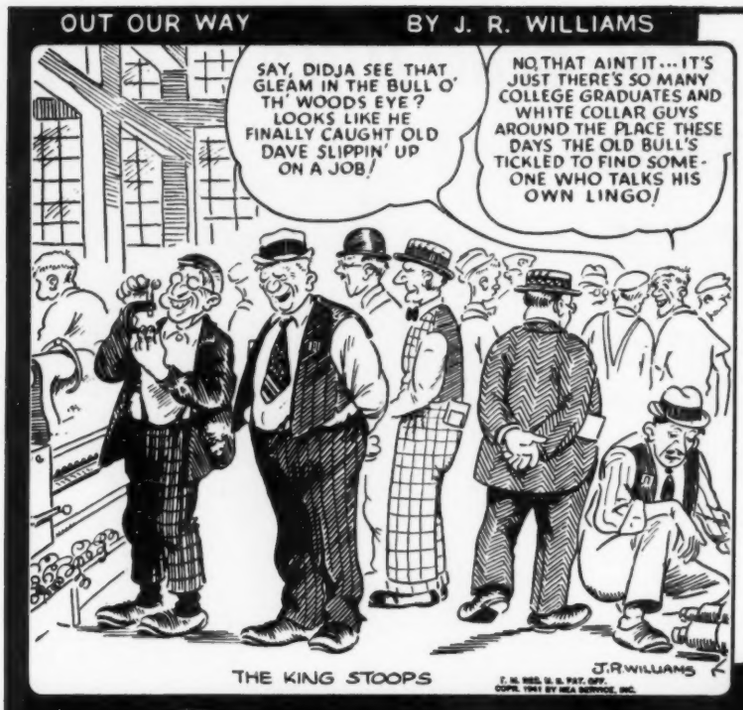
- Colvin—Aircraft Handbook, $5.00
- Wissman—Aircraft Inspection, $3.00
- Norcross—Aircraft Blueprints and How to Read Them, $1.75
- Elzea—Aircraft Welding, $2.00
- Frazer and Berthiaume—Practical Aircraft Sheetmetal Work, $3.00
- Naidich—Mathmatics for the Aviation Trades, $1.80
- Faulconer—Introduction to Aircraft Design, $2.75
- Nisita—Aircraft Riveting, $2.50

Name .....

Address .....

City and State .....

Position ..... Company ..... A. 12-10-42


OUT OUR WAY
BY J. R. WILLIAMS
SAY, DIDJA SEE THAT GLEAM IN THE BULL O' TH' WOODS EYE? LOOKS LIKE HE FINALLY CAUGHT OLD DAVE SLIPPIN' UP ON A JOB!
NO, THAT AINT IT... IT'S JUST THERE'S SO MANY COLLEGE GRADUATES AND WHITE COLLAR GUYS AROUND THE PLACE THESE DAYS THE OLD BULL'S TICKLED TO FIND SOMEONE WHO TALKS HIS OWN LINGO!
THE KING STOOPS
J.R.WILLIAMS

We know how the 'Old Bull' feels...

THIS WAR has changed things for everyone ...we all must *keep on* working harder, longer, better than we ever did before. This is the *only way* we can guarantee our ultimate victory. And at the same time, by our own foresight, by looking ahead and planning for the day when peace is won, we can do much to make sure that the boys on the fighting fronts will come home to jobs, to the opportunity to build a real future, to economic security and happiness. Let's waste no time in fulfilling this obligation to the very best of our ability...by tackling our post-war problems *now*.

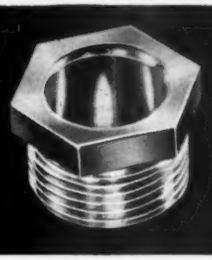
(*Below*) A few of the many thousands of our precision-made parts that help "Keep 'em flying and fighting."

ERICSSON ESTABLISHED 1911

ERICSSON

SCREW MACHINE PRODUCTS CO., INC.

25 LAFAYETTE STREET, BROOKLYN, N. Y.



A really fine tool room tool holder

THE AMERICAN TOOL HOLDER

★ EACH HOLDER HOLDS 3 SIZES OF BITS
★ EACH BIT MAY BE HELD IN 4 POSITIONS
★ GRIPS THE TOOLS WITH A WIDE GRIP

MAIL THE COUPON TODAY! →

COUPON

Please send complete information on the four standard sizes of American Tool Holders.

NAME ..... TITLE .....

COMPANY .....

STREET .....

CITY ..... STATE .....

A.M.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

STELLITE 98M2 METAL-CUTTING TOOLS

For Machining Steel . . . Available for Immediate Deliveries . . .

Stellite 98M2 tools are made of a cobalt-chromium-tungsten alloy especially designed to increase the speed of machining steel. Developed by Haynes Stellite Company and Union Carbide and Carbon Research Laboratories, Inc., Units of Union Carbide and Carbon Corporation, this new alloy represents another achievement in the production of non-ferrous alloy cutting tools.

Tested on War Production—Stellite 98M2 tools have been thoroughly tested in the machining of many types of steel parts needed in the war program and are now being used for a wide variety of operations on such parts. Specific operations for which Stellite 98M2 alloy tools have proved especially suitable include turning, facing, boring, grooving, and forming of all types of steel.

High Rates of Metal Removal—These tools have proved that they will machine steel at even higher cutting speeds than Stellite Star J-Metal tools or Stellite "2400" tools, and with longer life between grinds. With the new tools, heavy roughing cuts can be taken with coarse feeds—to get high rates of metal removal—yet tool life is long and economical, for this new alloy has an *unusually favorable balance of red hardness, edge strength, and toughness.*

Available Forms—Stellite 98M2 tools are furnished as standard square and rectangular tool bits and welded-tip tools. Many sizes and types are available for immediate delivery. In addition, Haynes Stellite Company is prepared to furnish special tools made of this alloy, cast and ground to customers' specifications.

Send for this new descriptive price list. It will help you select the sizes and styles of Stellite 98M2 Metal Cutting Tools you require.

STELLITE
Reg U S Pat Off

HAYNES STELLITE COMPANY
Unit of Union Carbide and Carbon Corporation
New York, N. Y. UCC Kokomo, Indiana
Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

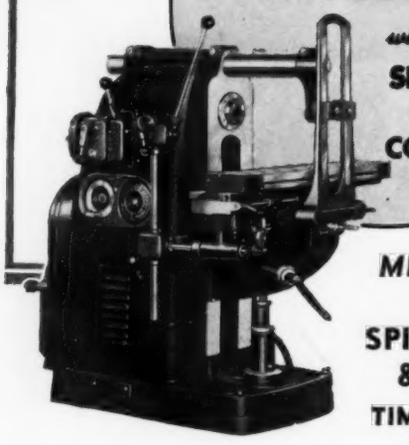
• HIGH-PRODUCTION METAL-CUTTING TOOLS •

The words "Haynes Stellite," and "Stellite" are registered trade-marks of Haynes Stellite Company

SIMMONS No. 1A

MILLING MACHINE

with SELECTOR DIAL CONTROL



***MICRO-SPEED* DRIVE**
SPINDLE BRAKE & CLUTCH
TIMKEN BEARING EQUIPPED

SIMMONS No. 1A Micro-Speed Milling Machine, designed for the rapid production of small precision parts, is efficient and simple to operate.

Micro-Speed Drive, our own variable speed transmission, provides a wide speed range for all classes of material or cutting tools. Selector Dial Control makes the speed change instantly at a turn of the handwheel adjacent to the selector dial on the column. The spindle is equipped with clutch and brake for instant starting and stopping.

Thus the operator is assured the right speed for the job. And that means higher precision . . . faster, more economical production! Write TODAY for descriptive bulletin.

SPECIFICATIONS

SPEEDS: 56—630 R.P.M.

RANGE OF FEEDS: Horiz., 34"; Cross, 8"; Vertical, 18½".

Awarded to the Simmons Machine Tool Corporation for excellence in production.

SIMMONS MACHINE TOOL CORP.
1759 NORTH BROADWAY ALBANY, N. Y.

SIMMONS
LATHES · TURRET LATHES · MILLERS · PLANERS · 6 BAR BORING MACHINES

SCREW MACHINE

Foremen, Set-Up Men and Production Engineers

SEND FOR THIS
CUTTING SPEED CHART

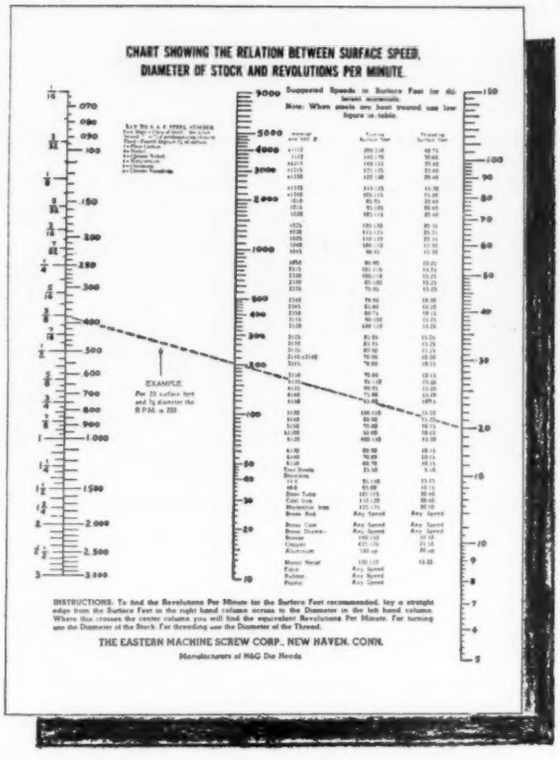


CHART SHOWING THE RELATION BETWEEN SURFACE SPEED, DIAMETER OF STOCK AND REVOLUTIONS PER MINUTE.
THE EASTERN MACHINE SCREW CORP., NEW HAVEN, CONN.

FREE - *to Users of H&G Die Heads*

A simple way to find R.P.M. for proper Surface Feet for threading 70 different S.A.E. metals and materials. No figuring. Simple. Easy. Quick.

H&G DIE HEADS

THE EASTERN MACHINE SCREW CORP.
20-40 Barclay Street
New Haven, Conn.

An unretouched photograph of an Oster No. 601 machine making a heavy forming cut. Note absence of chatter as demonstrated by the clean cut appearance of the stock.

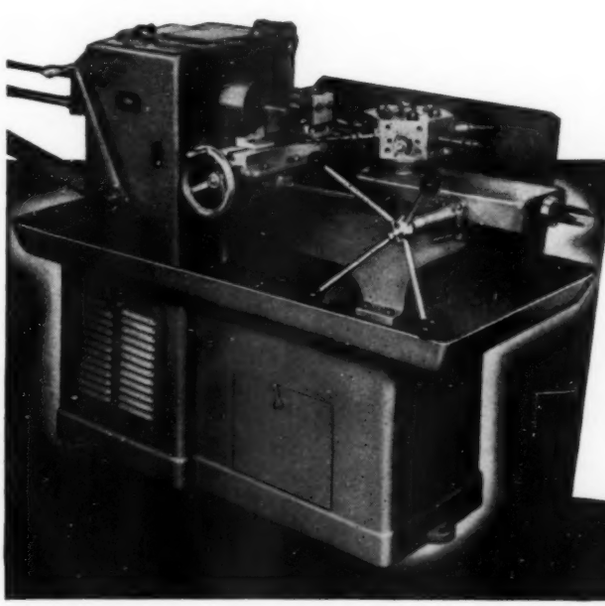
It takes a smooth, even flow of power (and plenty of it!) to make heavy forming cuts with absence of chatter, as illustrated in the above view. Batteries of Oster No. 601 machines are doing it on 'round-the-clock production schedules!

Equipped with *worm drive,* the smooth power of the No. 601 machine is obtained with the hardened and ground steel worm, which, like the spindle, is mounted in ball bearings.

(Where high speed work is required on small diameters and non-ferrous metals, the No. 601 is equipped with *direct drive* from motor to spindle. Spindle speeds up to 3000 R. P. M. are obtainable.)

Low Cost! Prompt Delivery!

Exclusive of tooling, the Oster No. 601 costs less than $2000.00 F. O. B. factory. Orders placed *NOW* will be scheduled for delivery in less than 90 days from date of order.



For Quick Action—USE THIS FORM!

THE OSTER MFG. CO. • 2049 East 61st St., Cleveland, Ohio

Rush, by return mail ..... copies of Catalog No. 27-A which contains full description and detailed illustrations of No. 601 Turret Lathe.

NAME .....

ADDRESS .....

CITY ..... STATE .....

Recommended Wheel specifications for correct tool room grinding are contained in this important folder.

These Three Folders WILL HELP YOU INCREASE YOUR GRINDING EFFICIENCY

There is little mystery to cylindrical grinding after you study the contents of this folder.

Centerless grinding will be easier after you look over this informative folder.

THREE new Sterling folders are just off the press, full of important data to help your "green" and veteran operators select grinding wheels most suitable for the wartime jobs you are now speeding through your plant.

Proper wheels for each job are a great help in getting work through your plant faster and better. Selecting the correct wheel for the job sometimes is difficult for many workmen . . now, these folders will do much to help in choosing the wheel of the correct bond, grain, size, and shape. Ask for the folder covering the type of grinding you are now doing.

Supplementing the important information contained in these folders is Sterling engineering service, available to all industry whether or not Sterling Grinding Wheels are being used. Consultation with a Sterling engineer is easy to obtain and will do much to increase efficiency in your grinding departments. There is no cost for this service; just write us today and your problem will secure quick solution.

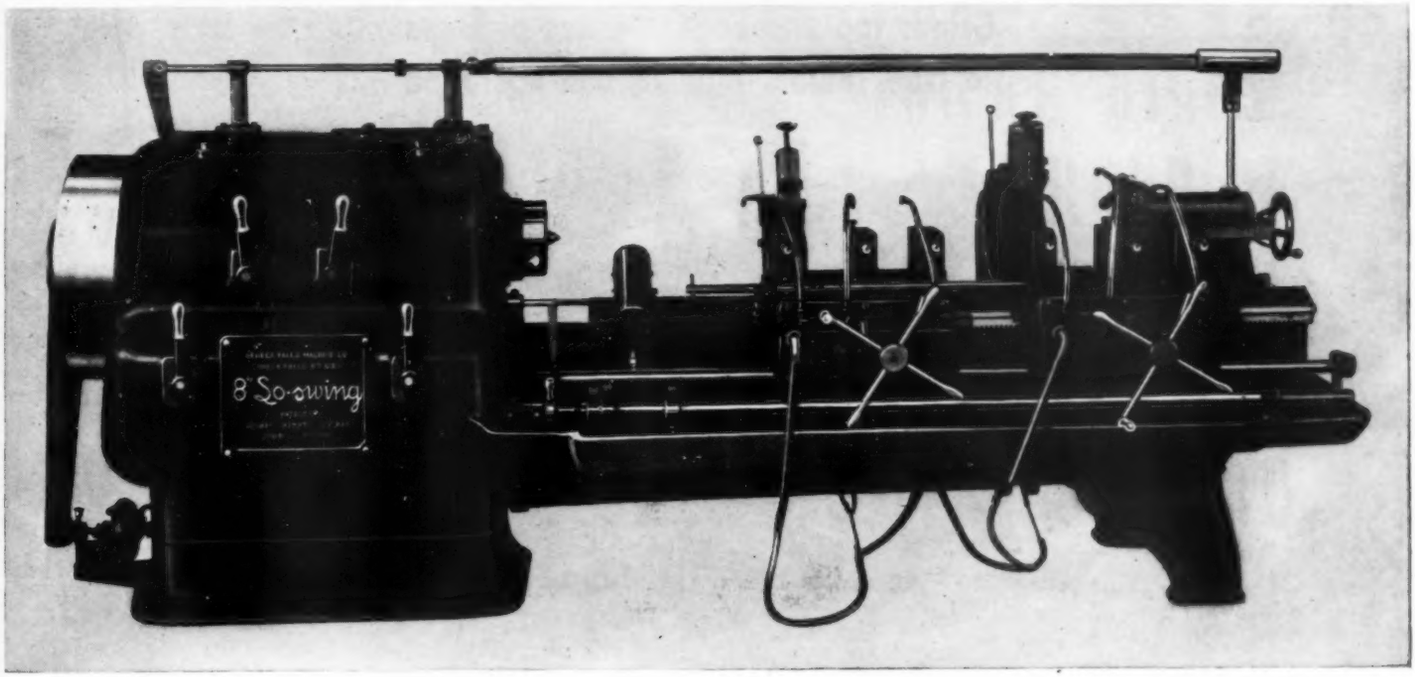
· STERLING ABRASIVES ·

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

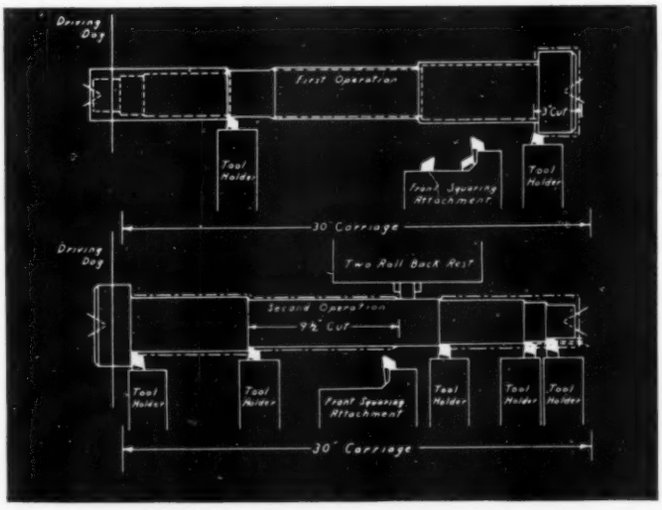
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE *Lo-swing* PEOPLE"** SENECA FALLS, NEW YORK



Turning Costs Reduced on Small Lots

OF HEAVY SPINDLES BY MULTIPLE TOOL SET-UP ON 8" *Lo-swing* LATHE



Tooling layouts for first and second operations.

PROBLEM: To reduce the cost of turning heavy spindles in small and medium lots.

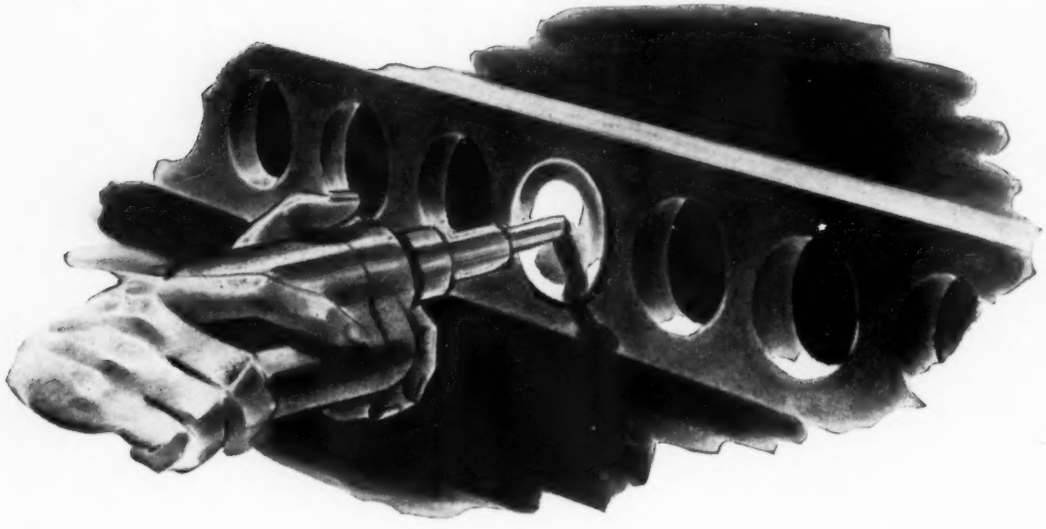
SOLUTION: An 8" *Lo-swing* Lathe was selected, because it had plenty of power to take heavy multiple cuts and offered a method of quick set-up with multiple tools, thus minimizing the time required in changing over from job to job.

The tooling layout shows a typical spindle which is completely rough turned in two operations on the 8" *Lo-swing* Lathe, illustrated above. Machining time for the first operation was 11.2 minutes. Machining time for the second operation was 10.25 minutes. Set-up time required to prepare the machine for this particular job was 30 minutes.

LATHE NEWS from SENECA FALLS

SLOTTED ABRASIVE DISC SPEEDS BURRING OF HOLES

Grinds top and bottom edges of holes to true radius — all in one operation



THE job of removing the burr and producing the true radius required on all holes in aircraft engines has been greatly simplified by the introduction of the slotted abrasive disc. Made of Aloxite Brand Electrocoated Aluminum Oxide Metal Cloth, these discs are being widely used for burring and polishing all metal hole edges, from $\frac{3}{8}$" to $5\frac{1}{2}$" in diameter.

The speedy performance of the disc is a result of the flexibility achieved by its slotted design. Using a disc proportionately larger than the diameter of the hole, mounted on a spindle for use in a portable electric or air-driven tool, the operator presses it against the edge of the hole, as in the diagram below. Accommodating itself to the opening, the disc "cones" backward, sanding only the edge of the hole, leaving the flat surface untouched.

If both ends of the holes are to be finished, two discs mounted back to back are used. They are first pushed through and then pulled back against the opposite edge of the hole.

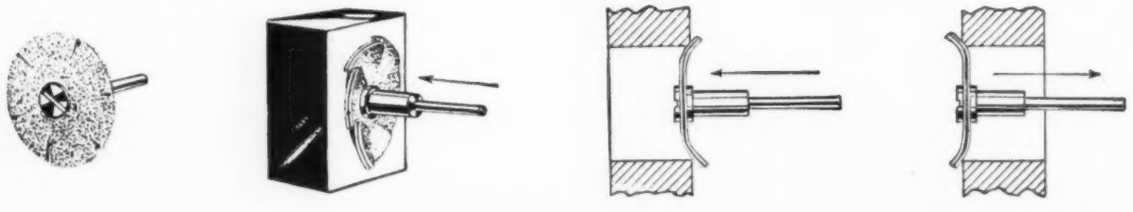
Uses for this new abrasive "Weapon for Production" are many and varied. Such parts as valve rocker arms, connecting-rods, tappet guides, oil holes etc., having openings larger than $\frac{1}{16}$", are typical of its wide application.

In ordering slotted abrasive discs, it is important to select the correct grit for the kind of metal employed and the finish required.

If you care to try a few of these slotted discs we will be glad to send them free of charge. Simply address your request to Dept. AM, The Carborundum Company, Niagara Falls, N. Y.

CARBORUNDUM
ABRASIVE PRODUCTS

DIAGRAMS SHOW HOW SLOTTED DISC WORKS



THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.
REG. U. S. PAT. OFF.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company)

"YOU'RE RIGHT, I *AM* PROUD OF OUR ARMY-NAVY "E" AWARD

". . . Who wouldn't get a lift from the fact that the Army and Navy have told us that we've been doing a better than average job?

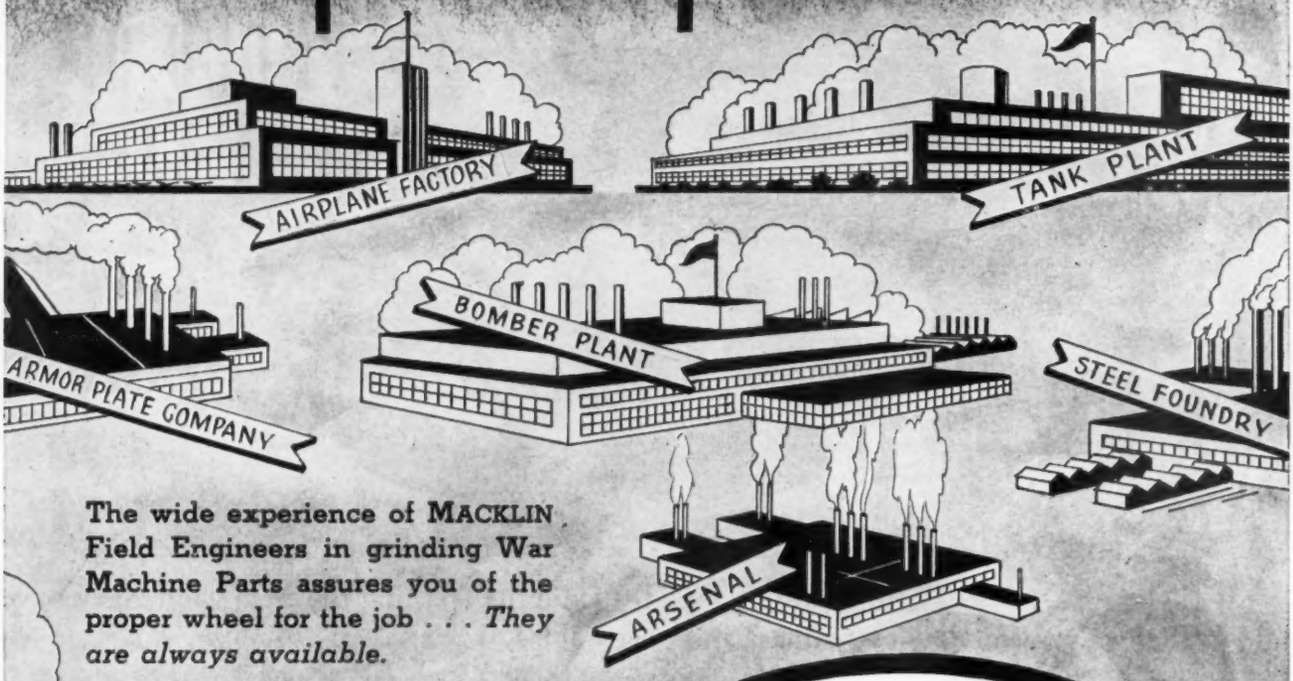
"But there are other things — things that probably have contributed to this award — that make me feel pretty good, too. I've seen every man and woman in this gage plant working, not with the idea of recognition in mind, but just to help win this war.

"I've had a part in the development of new ideas in gage-making . . . using Carboloy and chrome plate in ways that never were thought of before . . . providing much longer life, more lasting accuracy and far greater inspection usefulness in products such as we manufacture. And I know, too, that these ideas have helped to save steel . . . to increase gage manufacturing capacity . . . and to cut down on rejections of important and expensive armament parts in final inspection. These things prove to me that we've been doing what other good gage-makers around the country have been doing — working harder to do something that will contribute just a little more in this War Effort.

"And let me tell you this. The flag over our plant and these pins on our lapels mean more to us than recognition for the job we've done. They mean that we have what it takes to do *much more* than we've done. Speaking for the gang at Lincoln Park, we'll be really in high gear from here on in."

LINCOLN PARK TOOL and GAGE CO.
LINCOLN PARK, MICHIGAN

MACKLIN
Grinding Wheels



The wide experience of MACKLIN Field Engineers in grinding War Machine Parts assures you of the proper wheel for the job . . . *They are always available.*

MACKLIN COMPANY

Manufacturer of Grinding Wheels

JACKSON, MICHIGAN, U. S. A.

Sales Offices

CHICAGO - NEW YORK - DETROIT - PITTSBURGH
CLEVELAND - CINCINNATI - MILWAUKEE
PHILADELPHIA

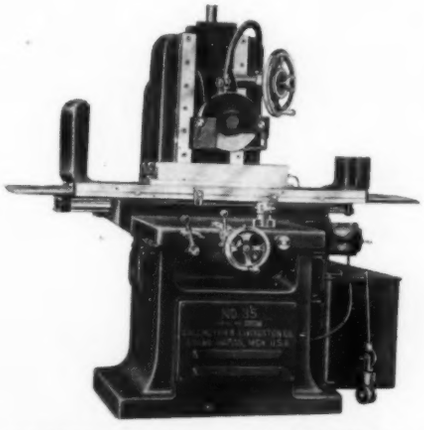
Photo by
U. S. ARMY
Signal Corps

ACCURACY
on the production line means
PRECISION
on the firing line . . .

Grand Rapids Grinders help produce the famous Bofors gun

Important parts of the modern Bofors gun are being produced by grinding to close limits on Grand Rapids machines.

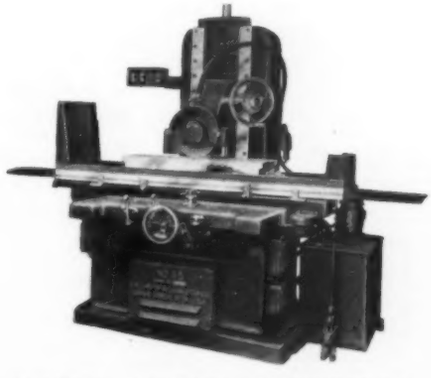
The foundation for today's exacting demands in precision and speed are laid in the design of Grand Rapids machines more than 35 years ago. Originally developed for high precision and smooth operation, Grand Rapids Hydraulic Feed Surface Grinders are particularly well adapted to the exacting needs of the busy tool rooms and production lines of shops busy on war work. Grand Rapids Grinders are available in types and sizes for a wide range of work. Ask for details.



#35 GRAND RAPIDS HYDRAULIC FEED SURFACE GRINDER

This Grand Rapids machine is ideally suited to close tolerance grinding because of its smooth operation. Rigidity of construction and permanence of alignment are assured by a massive one-piece column and base casting. Cross feed ways are of generous proportions so that the weight carried is immediately above the base walls eliminating all possibility of sag or alignment.

The #35 Grand Rapids has a table working Surface of 8"x24", automatic longitudinal table travel of 26" and a transverse travel of 9¼".



#55 GRAND RAPIDS HYDRAULIC FEED SURFACE GRINDER

Similar in basic construction to the #35 machine, the #55 machine provides a table working surface of 12"x36", automatic longitudinal table travel of 38" and a transverse travel of 13½". Spindles on these machines are mounted in preloaded ball bearings. A separate motor is used for driving the grinding wheel spindle. The spindle head has the elevating screw directly central between the vertical ways so that any tendency to cramping action is eliminated.

GALLMEYER & LIVINGSTON CO.

330 STRAIGHT AVE., S.W. GRAND RAPIDS, MICHIGAN

NOW APPLY & CHANGE POLISHING AND ABRASIVE DISCS *in 15 seconds!* *with* DISTIC

(DISC STICK)

Save TIME & MONEY, reduce MACHINE TIE-UPS speed-up PRODUCTION

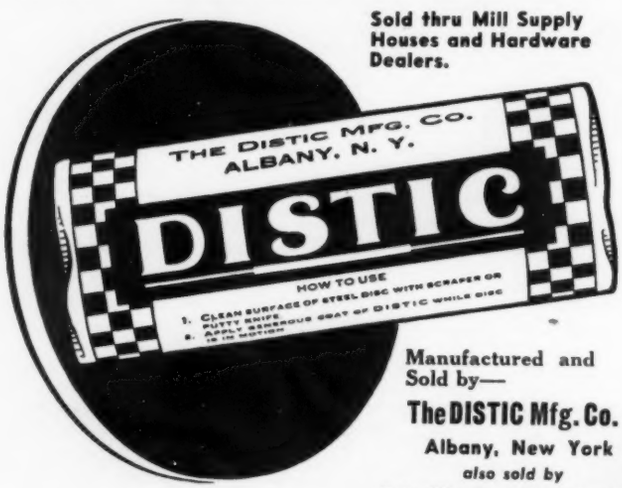
Today, every minute counts—idle labor costs, machine slow downs, and costly operations must be held to a minimum. Old methods of applying and changing polishing and abrasive discs to steel discs are costly, and when 10 or 12 changes a day are made losses multiply.

Now with DISTIC changes are made in 15 seconds! —a real time and money saver. In handy stick form, it is convenient and easy to use. Simply clean surface of steel disc with scraper, apply generous application of DISTIC while disc is in motion, stick disc onto steel disc and press firmly. The machine is now ready for use. To remove old disc simply peel it off.

DISTIC is clean, safe, odorless, and will not dry out. Start using this proven time and money saver in your plant now. Available in cartons of 12 or 24 sticks, and larger quantities.

★ SEND FOR FREE TRIAL STICK—write now ★

Sold thru Mill Supply Houses and Hardware Dealers.



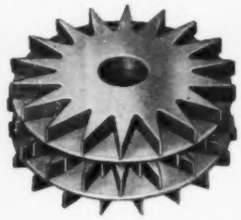
Manufactured and Sold by—

The DISTIC Mfg. Co.

Albany, New York

also sold by

Delta Mfg. Co., Milwaukee, Wis.



DESMOND

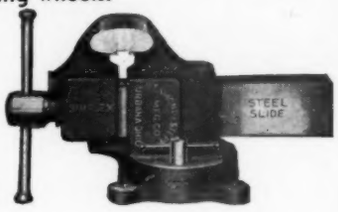
GRINDING WHEEL DRESSERS & CUTTERS

We manufacture a complete line of wheel truing tools and can supply the proper dresser for each of your grinding wheels.

SIMPLEX

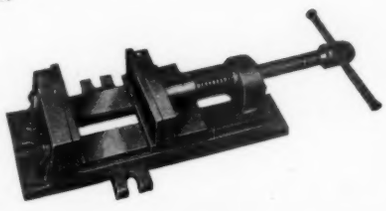
Steel Slide

VISES



A full line of Machinists, Welders, Filers, Production and Drill Press & Milling Machine Vises with solid steel slides.

Write for copy of catalog "A" and name of your nearest dealer who can supply you.



THE DESMOND-STEPHAN MFG. CO.

URBANA, OHIO

for ECONOMY—*for* HIGH SPEED PRODUCTION

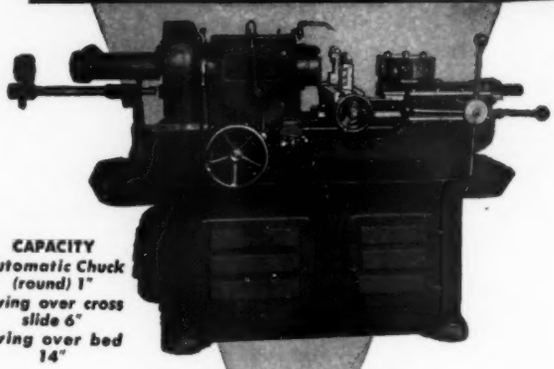
The MOREY 2G

Back-Geared

TURRET LATHE

Timken Bearing

Self-Locking Turret and Infinite Spindle Speeds



CAPACITY

Automatic Chuck (round) 1"

Swing over cross slide 6"

Swing over bed 14"

Thousands of the MOREY 2G Turret Lathes are saving money with no sacrifice of high speed production. Economy features: Back Gears are instantly thrown in through extra large Twin Disc Clutch—Full advantage from high speed and carbide tools —Vibrationless precision and an infinite variety of spindle speeds for every job—Timken bearing—Self-locking turret. Can be furnished with tooling.

Ask for Circular 629 for full details

MOREY MACHINERY CO., INC

410 BROOME STREET • NEW YORK, N. Y.

BEGIN OUR *Second Year* OF THE WAR BY ELIMINATING EYE INJURIES

Install a Complete AO GOGGLE PROGRAM

During the first year of America's war against Axis tyranny, we lost, through industrial eye accidents, the services of a large force of our skilled soldiers of production. Avoidable eye accidents cost us and our allies enough man-days to build hundreds of bombers, thousands of tanks.

Stop eye injuries in your plant *now*, with a complete and carefully planned AO eye protection program.

In addition to a line of comfortable, protective goggles, AO offers you the following important helps: Advisory services of a specially trained AO Safety Representative. Plant analyses to determine the maximum protection against every type of eye hazard . . . Posters . . . Charts and guides for correct eye protection procedure . . . and other informative literature.

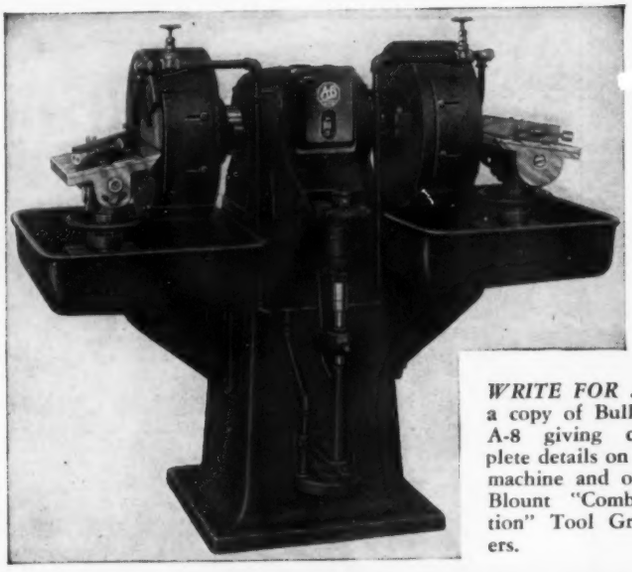
Get in touch with your AO Branch Office today.

American Optical COMPANY
SOUTHBRIDGE, MASSACHUSETTS

MODEL TC WET GRINDER

"Blount"

FOR COOLER, CLEANER, FASTER AND MORE ACCURATE TOOL GRINDING



WRITE FOR . . . a copy of Bulletin A-8 giving complete details on this machine and other Blount "Combination" Tool Grinders.

Today's demands for faster, precision production can be met by the proper conditioning of tools assured by this "BLOUNT" Tool Grinder.

Equipped with adjustable graduated tables, the Model TC will grind all possible angles and clearances on tools.

Features include fully enclosed ball bearing motor; collant tank of ample capacity and easily removable sludge pan in column; vertical motor-driven centrifugal coolant pump; heavy, quickly adjustable guards.

Condensed Specifications

Base of column: 23" x 24"

Base to center of spindle: 37½"

Pan: 6" deep x 27½" wide

Table top: 9½" x 11½"

Adjustable table tops: hardened and ground and equipped with protector guide.

Motor: 3 HP.; 1200 RPM; all voltages

Wheels: cup 14" x 4" x 11"

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*

Vitrified Wheels

To familiarize you with the complete VITRIFIED LINE . . . . .

All the advantages of economy, long life, accuracy and low cost production are available through standardization on Vitrified Grinding Wheels which are available for every kind of grinding job.

The Vitrified Line includes:

BORITE—for grinding steel of all kinds

CARBORITE — for cast iron, bronze brass and aluminum

SILICATE BONDED—for grinding steel to a fine edge and also for surface grinding

SHELLAC BONDED — for high finish, and also in very thin sizes

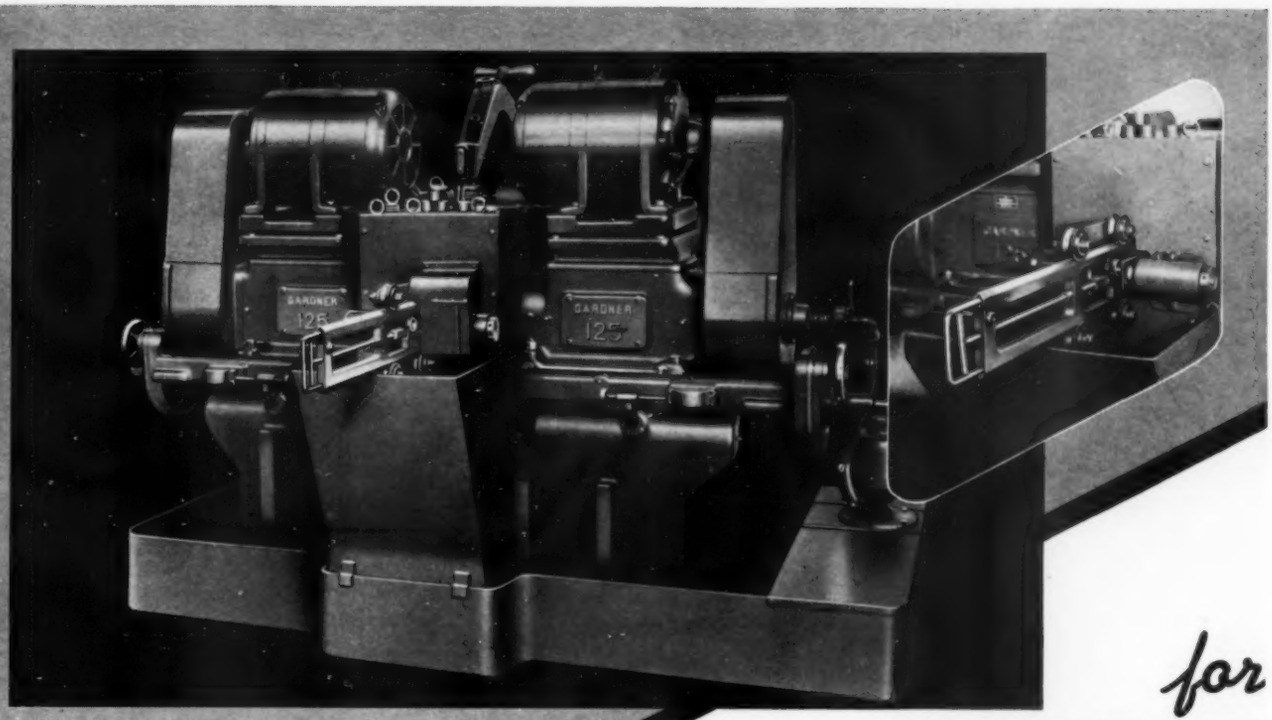
RESINOID BONDED — for high speed service in snagding steel and malleable castings, etc., and also for cutting off

Our representative will gladly recommend the wheel best suited to your grinding requirements. Full details of the Vitrified Line are available in our catalog. Ask for it.

VITRIFIED

VITRIFIED WHEEL COMPANY

WESTFIELD **MASS.**



for

EXTREME ACCURACY—

but *moderate* production

YOU don't have to take on a high-production job before you can reap the full benefit of Gardner PRECISION Grinding.

For modern Gardner Double Grinders are turning in great accuracy records when equipped with Hand-operated fixtures for moderate production. In fact, these machines are identical with the better-known high-production tools, except in the type of fixturing.

HERE is an excellent example, representative of many.

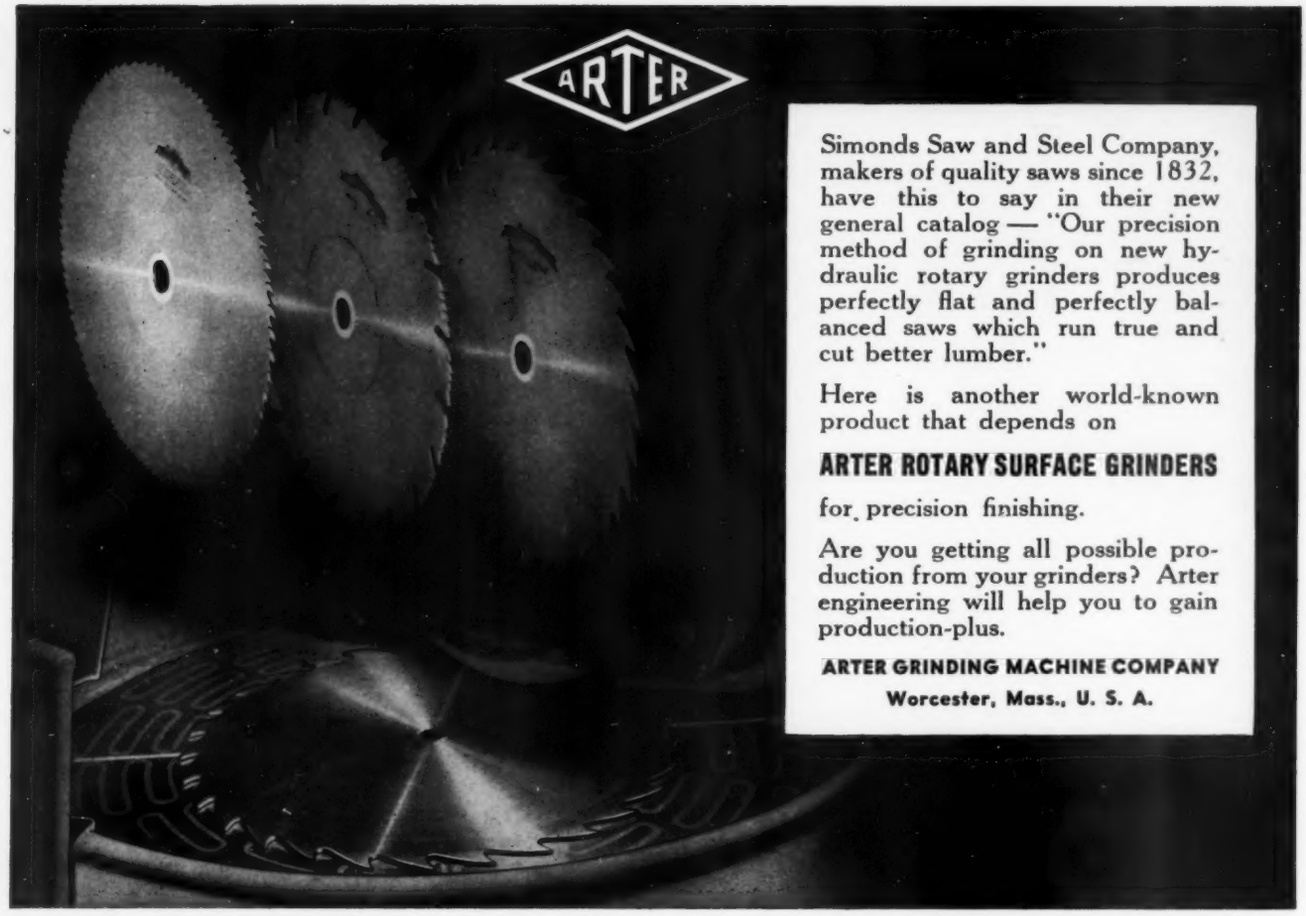
Steel spacing collars, measuring 1⅛" to 1¾" O.D., and ⅞" maximum length, are ground at the rate of 6 TO 8 PER MINUTE on this Gardner No. 125—23" PRECISION Grinder, using a roller gun-type sliding fixture. Tolerances: .0002" to .0005" for parallelism, and ±.002" for uniformity, based upon .008" to .010" maximum overall stock removal.

Purely hand-operated, but you get EXTREME ACCURACY, with good production.

WRITE FOR DETAILS!

GARDNER MACHINE COMPANY

410 East Gardner Street » » » » Beloit, Wisconsin, U. S. A.



Simonds Saw and Steel Company, makers of quality saws since 1832, have this to say in their new general catalog — "Our precision method of grinding on new hydraulic rotary grinders produces perfectly flat and perfectly balanced saws which run true and cut better lumber."

Here is another world-known product that depends on

ARTER ROTARY SURFACE GRINDERS

for precision finishing.

Are you getting all possible production from your grinders? Arter engineering will help you to gain production-plus.

ARTER GRINDING MACHINE COMPANY
Worcester, Mass., U. S. A.

CARD MACHINE SCREW TAPS

The CARD Quality

Buy them and put them to work

Carbon and High Speed Steel

Manufactured in Regular Type in 2, 3 or 4 flutes according to size and in Spiral Pointed Type in 2 flutes.

Both Regular and Spiral Pointed Types are furnished with National form of thread. Regular Type furnished in taper, plug or bottoming styles; Spiral Pointed furnished in plug style only. Furnished in Carbon, High Speed cut and High Speed Ground Thread.

Put Card Machine Screw Taps to work and their performance will convince you of their economy. You'll find sizes listed in the Card Catalog No. 34, page 32-37. Circular covering recommended uses available on request.

Leading dealers carry the Card line

S. W. CARD MANUFACTURING CO.
Mansfield, Mass., U. S. A.
DIVISION OF UNION TWIST DRILL CO

STORES: New York: 61 Reade St., Chicago: 11 S. Clinton St. Detroit: 6540 Antoine St., San Francisco: 121 Second St. Seattle: 568 First Avenue, South Los Angeles: 524 East Fourth Street

PUMP PARTS PRECISION BORED IN 25 SECONDS

SIMPLEX PRECISION BORING MACHINE MAINTAINS ACCURACY AND FINISH

This prominent mid-western manufacturer, when switching from non-essential production to a wartime job, installed Simplex Unit-type Precision Boring Machines for all boring operations requiring a high degree of finish and accuracy.

This two-way or duplex-type machine is used to bore from both sides of the pump housing simultaneously. Diameters are held to ±.0005", insuring precision fits to bearings and oil seals.

SPECIAL PRECISION BORING MACHINES WITH GENERAL PURPOSE VERSATILITY

Simplex Precision Boring Machines are designed with adjustable units so that either short-run precision boring or production boring can be accomplished. Spindles are adjustable, and the machines can be provided with one or more spindles as desired. Over 25 different basic models of Simplex Precision Boring Machines have been designed to meet practically any type of precision boring problem.

Our engineers will be glad to make a study of your parts and production for faster and better precision boring.

Send part prints and production figures . . . no obligation.

PRECISION BORING DATA

PART—Pump Housing.

MATERIAL—Cast Iron.

HOLDING METHOD—Special Holding Fixture.

MACHINE—#2U 2-Way Simplex Precision Boring Machine.

OPERATIONS—Precision Bore Bearing and Oil Seal Fits and Chamfer One Bore.

TOLERANCES—±.0005" Dia.
—±.005" Depth.

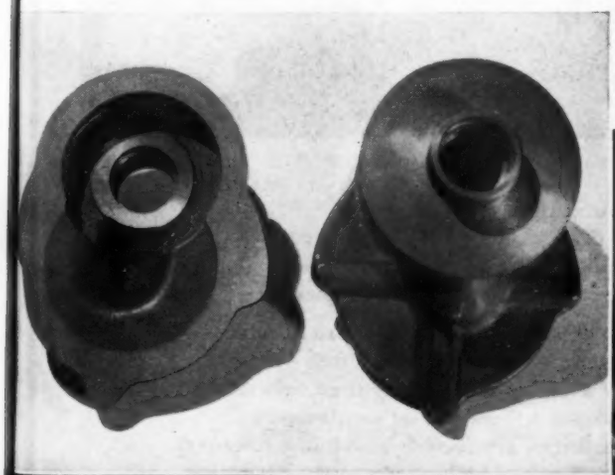
FEED—1⅜" per Minute.

SPEED—1150 r.p.m.

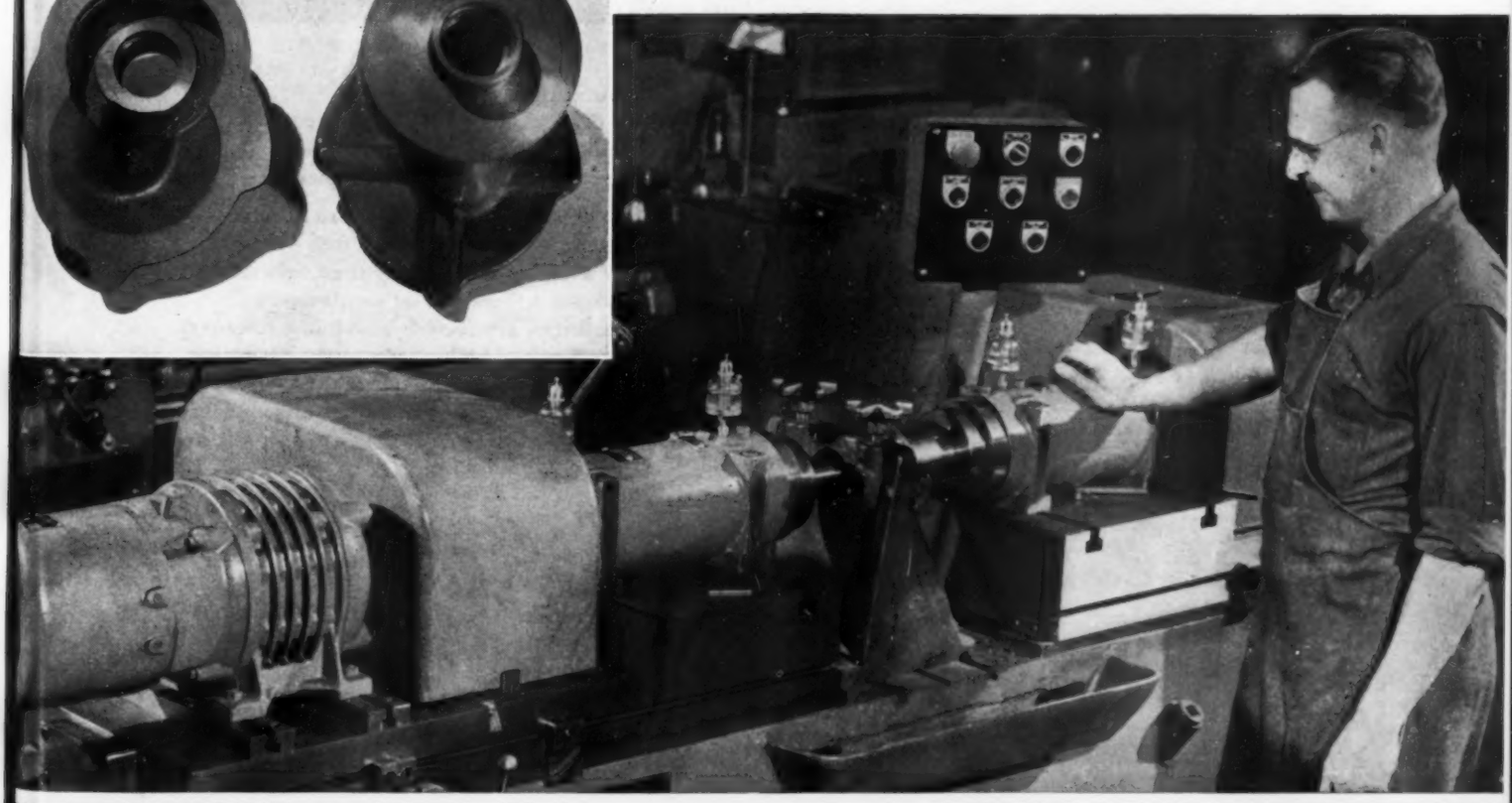
FLOOR-TO-FLOOR TIME—8 Minutes, including inspection.

FREE DATA

Write for these two booklets covering our complete line of precision boring machines. Complete specifications of each type are included. Ask for Precision Boring Machine booklets.



PRECISION BORING FROM TWO SIDES SIMULTANEOUSLY



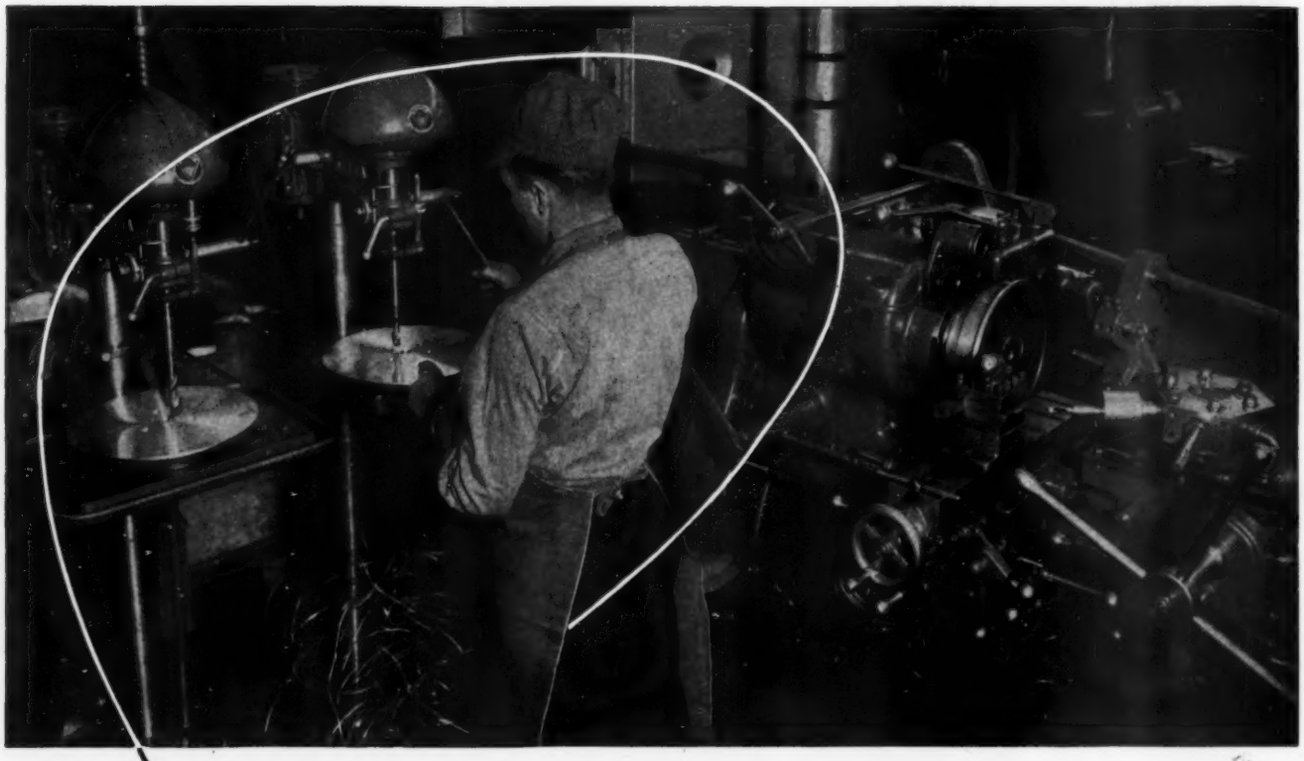
STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

4524 WEST MITCHELL STREET · MILWAUKEE, WISCONSIN

where you want them

when you want them



The *portability* and *flexibility* of Delta machines open many roads to increased production: Here illustrated are two 14-inch Delta Drill Presses set up alongside a screw machine. Operator performs two hand-feed operations on drill presses while waiting for power-feed on screw machine.

Other examples: When five drilling and tapping operations are required, a single spindle Delta Drill Press is moved up alongside a four-spindle drill press . . . to save toolmaker's walking and waiting time, individual Delta Drill Presses, Grinders and Band Saws are set up alongside each toolmaker's bench . . . when jobs are too big and bulky to move, Delta machines are adapted so they can be brought to the operation. (Full details will be furnished on request illustrating these and many other cases where Delta portability and flexibility have been utilized to solve production problems.)

DELTA DESIGN ALWAYS OFFERS THESE ADVANTAGES

Low First Cost

Low Maintenance Cost

Economical Operation

Reduced Labor Costs

Greater Flexibility

Portability

DELTA
MILWAUKEE

Send for FREE "Tooling Tips"

Write for this practical shop bulletin showing how other manufacturers are taking advantage of the many features of DELTA-Milwaukee machines. Also for latest complete catalog. Get in touch with your Delta Industrial Distributor or write to The Delta Manufacturing Company, 608-N E. Vienna Ave., Milwaukee, Wis.

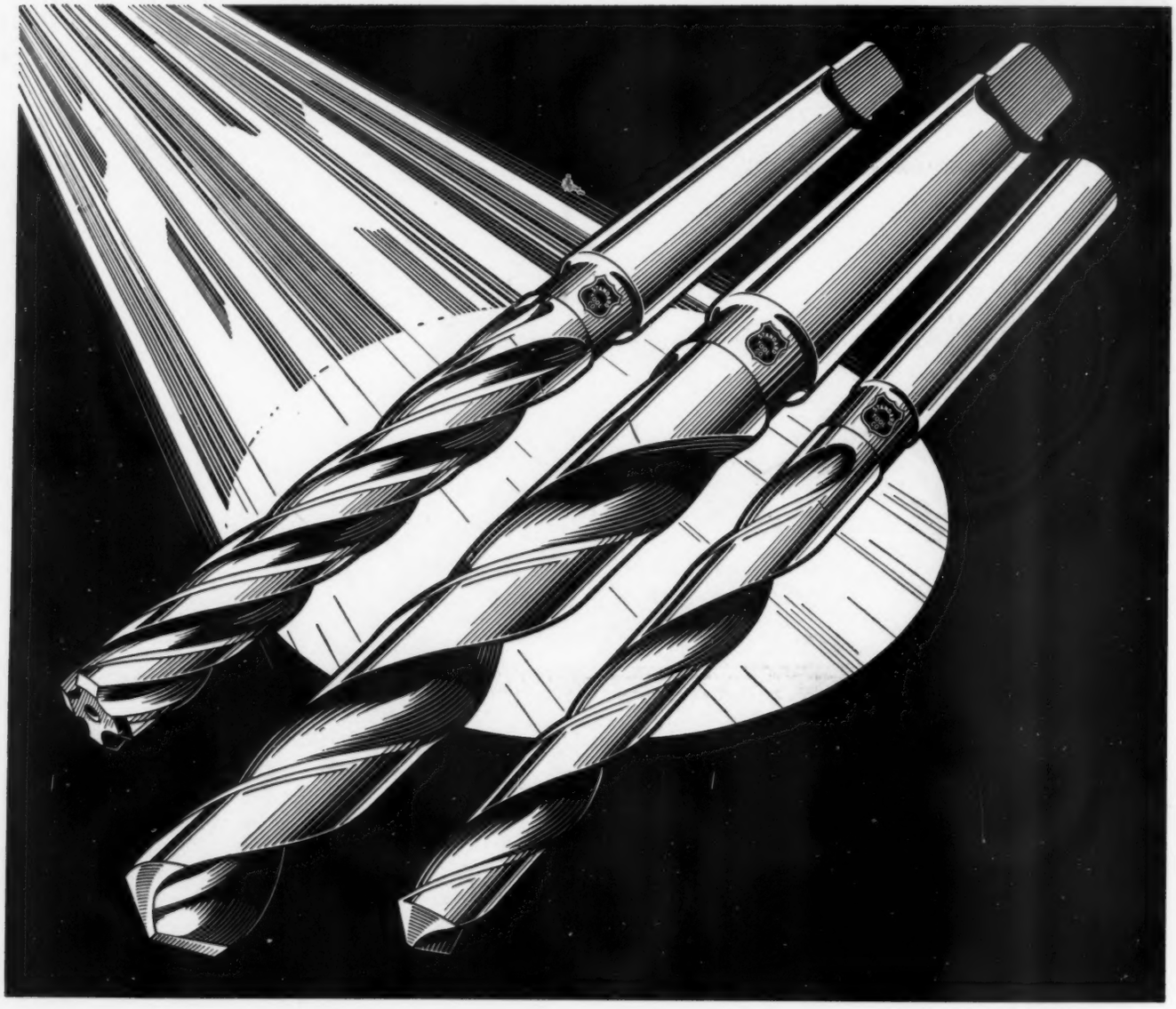
For maximum range in Action ACCURACY is of extreme importance. The reputation of Winter Taps was built on their long range performance. Winter accuracy eliminates work spoilage by better thread fits—saving vital metal parts which otherwise might be rejected.

A division of

THE NATIONAL TWIST DRILL & TOOL CO.

Detroit, Michigan

Winter Brothers
COMPANY
Wrentham, Massachusetts, U. S. A.

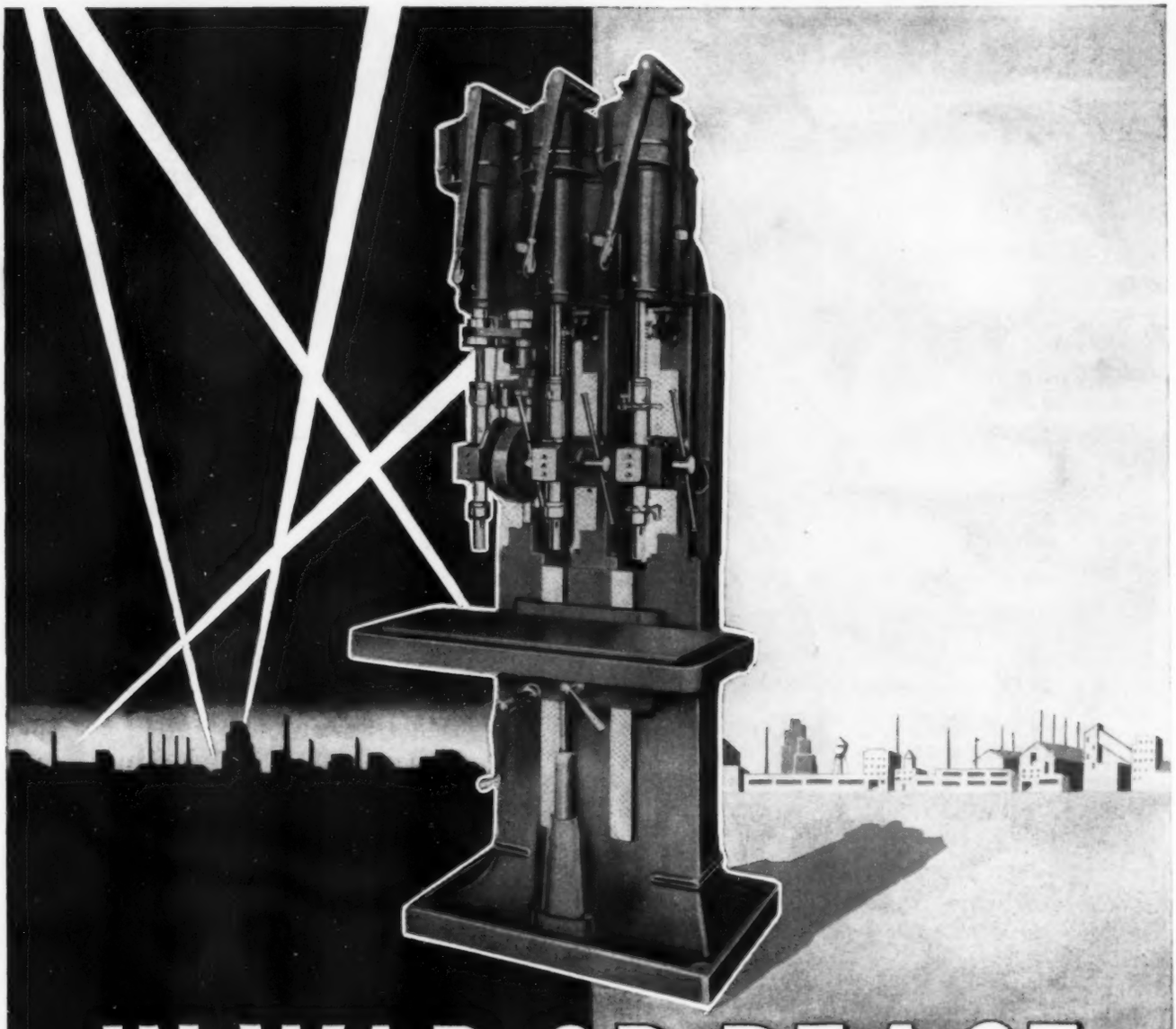


Twist Drills · Milling Cutters
Taps · Dies · Reamers · Drill Chucks
Wheel Dressers · Special Tools

THE STANDARD TOOL CO.

CLEVELAND

NEW YORK • DETROIT • CHICAGO



IN WAR OR PEACE

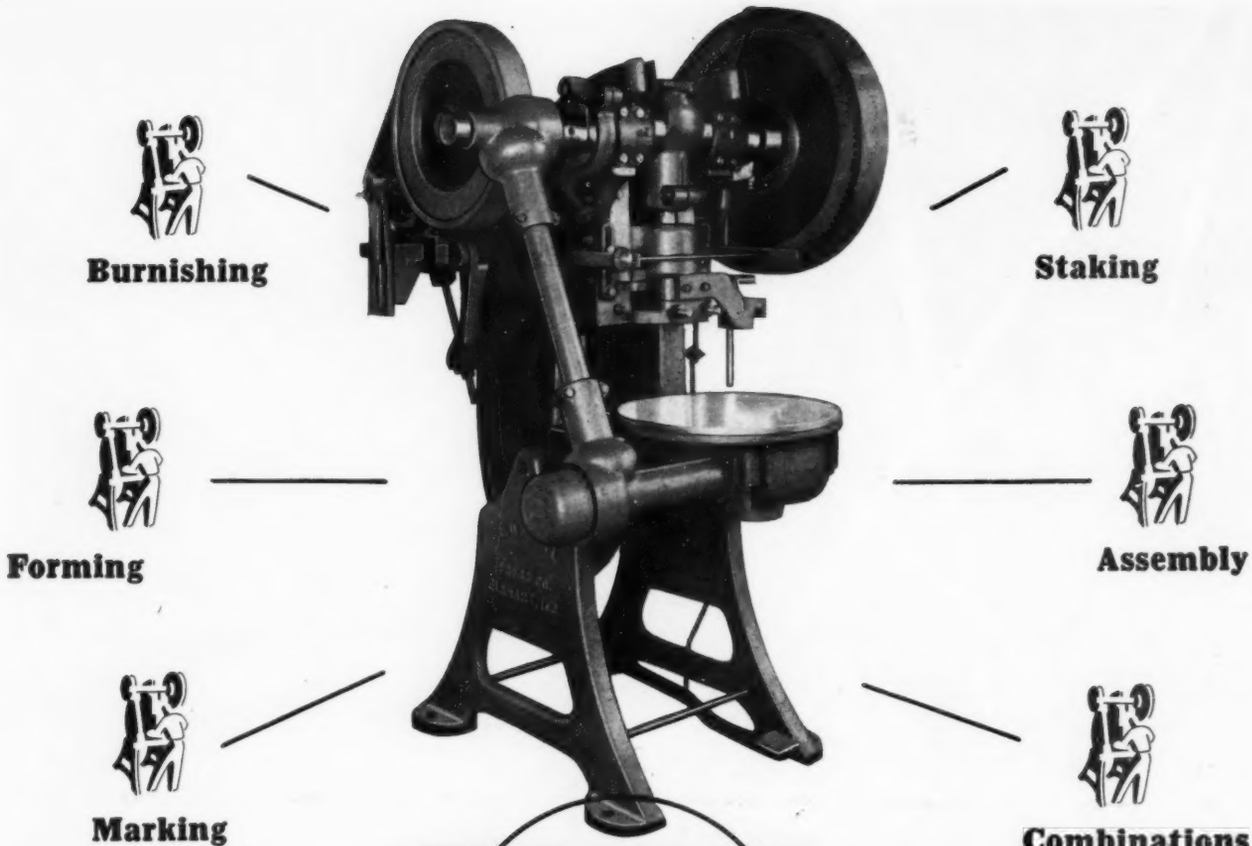
Today, men are studying post war problems. You, too, are undoubtedly giving this problem equally serious consideration. One problem can be solved now. The standard design of the Avey Type MA-6 Drilling Machine is easily adaptable to your War or Peace production line. The advantages of a drilling machine that requires no elaborate and expensive changes have been appreciated by many of America's leading industries.

This Avey Drilling Machine, Type MA-6, is now being built in No. 2 size (capacity in cast iron, 7/8"). No. 3 size (capacity in cast iron, 1¼"). One to six spindle units, either size. Six speed machine, two speed motor with three mechanical changes through gearing. Speed range is eight to one. Push button control. The above illustration shows the MA-6 equipped with three spindles, the Aveymatic Feed, Hand Feed and Tapper.

THE AVEY DRILLING MACHINE CO.
CINCINNATI, OHIO, U.S.A.

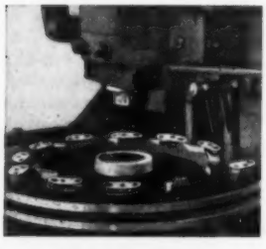
CINCINNATI · OHIO

Avey DRILLING MACHINES



FEDERAL
DIAL FEED
PRESSES

V for *Variety* of jobs they can do



FEDERAL Dial Feed Presses are daily performing a wide variety of jobs which, until recently, were not thought of as press operations. Their versatility is limited only by the skill and resourcefulness of the production engineer. Originally employed for secondary operations, these precision presses are being used for primary and assembly work, and in some cases perform intricate combinations of all. Burnishing, forming, staking, and high speed marking are handled with ease.

FEDERAL Dial Feeds are speeding war production in hundreds of plants. They are fast, safe, smooth, precise. Easily indexed to any part of crankshaft revolution from 90 to 180 degrees, giving long or short dial dwell. 10 or 12 stations. Dial feed is available on eight different size presses. Write today for literature, or help in working out a specific problem.

THE FEDERAL PRESS CO.
612 Division Street, Elkhart, Indiana.

9 FEDERAL SIZES Federal Open-Back, Inclinable Presses are available in nine sizes, with capacities ranging from six to 80 tons—either flywheel or geared type. They are the products of 40 years' experience in press building.

Tool Conservation begins in the Tool Crib

Know Where ALL YOUR TOOLS are ALL THE TIME!

No time is lost accounting for this reamer. The attendant hands it over to the operator in exchange for a requisition.

This wide window ledge, chest high, provides a convenient writing space and under it ample easy-to-get-at storage space for frequently used items.

Photos Courtesy General Electric Co. of Philadelphia

A PRACTICAL tool accounting system saves tools, time and money. One simple but highly effective method is illustrated here. Machine operators make out their requisitions on wide ledges or counters. When the tool is issued the requisition is hung on the "Out-Tool" board under the operator's own special number. It stays there until the tool is returned. This is a simple system, but highly efficient and speedy in practice.

Another proven practical plan is to exchange the tool for a metal tool check with the operator's number on it.

After all, the exact system used is less important than knowing where tools are and being able to issue them quickly. Wasting time at the tool crib window means lost time at the machine. These days America can not afford wasted time!

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

DETROIT PLANT: 5850 Second Boulevard

WAREHOUSES in New York, Chicago and Los Angeles

In Canada: GREENFIELD TAP AND DIE CORP. OF CANADA, LTD., GALT, ONT.

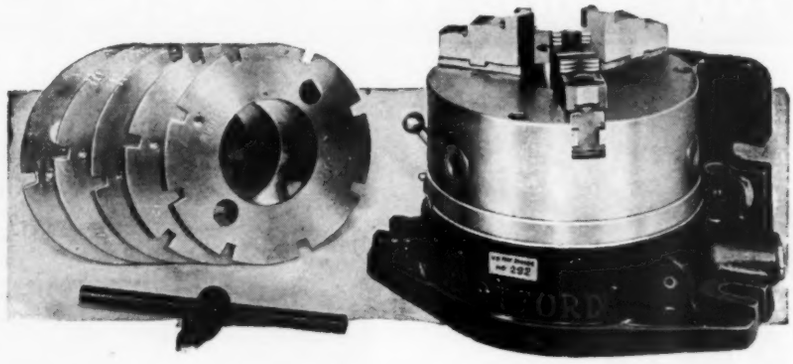
ARMY E NAVY

GTD GREENFIELD

TAPS · DIES · GAGES · TWIST DRILLS · REAMERS · SCREW PLATES

Save Time—
Reduce
Rejections—
by equipping
your machines
with the

HARTFORD SUPER-SPACER



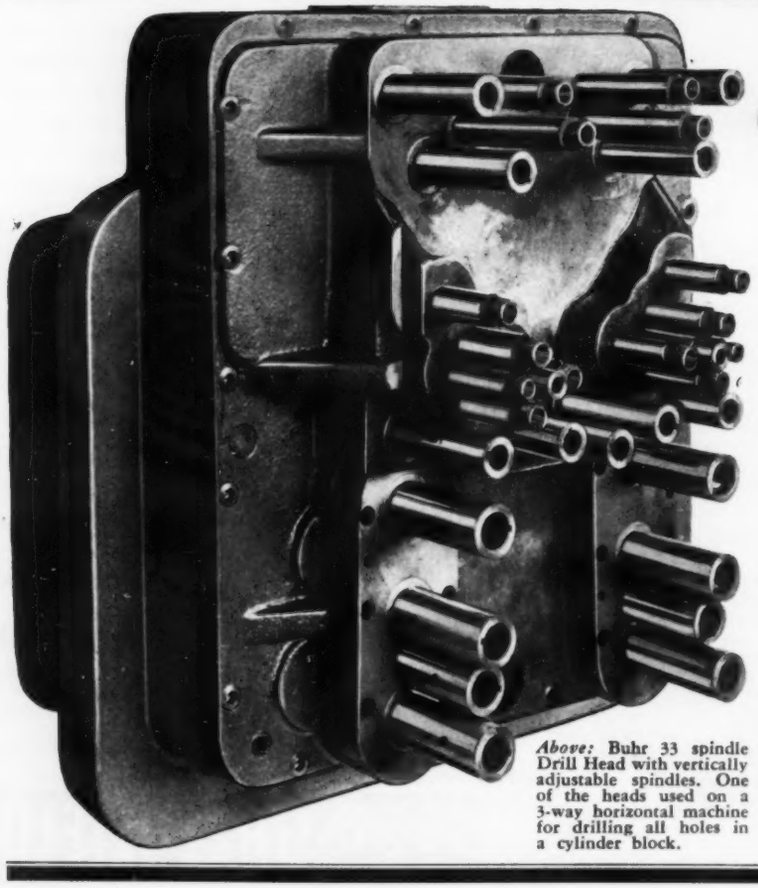
The Hartford Super-Spacer provides a practical, proved means for speeding indexing work. Its ability to hold work securely makes it possible to step up speed and feeds and thereby increase machine productivity. All chance of error in indexing is eliminated by mask plates.

This modern, sturdy device provides a fool-proof way to save time on milling, drilling, slotting and planing operations. It is practical and economical to use on single piece work or quantity production. No special skill is required to attain accurate results. Investigate today!

COMPLETE DETAILS WILL BE SENT PROMPTLY ON REQUEST

THE HARTFORD SPECIAL MACHINERY COMPANY

HARTFORD CONNECTICUT



Above: Buhr 33 spindle Drill Head with vertically adjustable spindles. One of the heads used on a 3-way horizontal machine for drilling all holes in a cylinder block.

Buhr DRILL HEADS SIMILAR TO THIS ONE

ARE WORKING NIGHT AND DAY PRODUCING SUPPLIES FOR OUR FIGHTING MEN

• This is but one of many BUHR-designed drill heads now being used in night and day production to supply our fighting forces. Similar applications of BUHR Multiple Spindle Drill Heads *will* speed your work. Give them a trial in your plant. Send us your blueprints—we'll make suggestions and recommendations on the use of BUHR-engineering and equipment.

BUHR MACHINE TOOL CO.
ANN ARBOR, MICH.
Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

"What— no extra Calipers?"

Yes, plenty of extra pairs . . . thanks to a Distributor's salesman who knew where to look

He was new in the place—his first job was checking odd lots of shafting. All ready, except for calipers—not a pair to be found.

"Hey, loan me your calipers" he yelled across to the next man—"what kind of a place *is* this that doesn't have scads of 'em in easy reach?"

But that man's calipers couldn't be spared. In fact, it finally developed that no dealer in the city had any in stock. But as usual—

The representative of an Industrial Supply Company happened to know where he could pick up a box of brand-new ones that the owner didn't need and was willing to sell. Everybody happy!

This incident is typical of the unusual services that many Mill Supply Distributors are rendering their customers during the Emergency.

The Representatives of *your* nearby Industrial Supply Houses not only can do a "Sherlock Holmes" helping you unearth scarce materials now and then, but can lend your short-handed Purchasing Department valuable help in other ways besides.

You can call in their help with full confidence—because they are our own Industrial Distributors, selling Cle-Forge High-Speed Drills and Peerless High-Speed Reamers throughout America during many years.

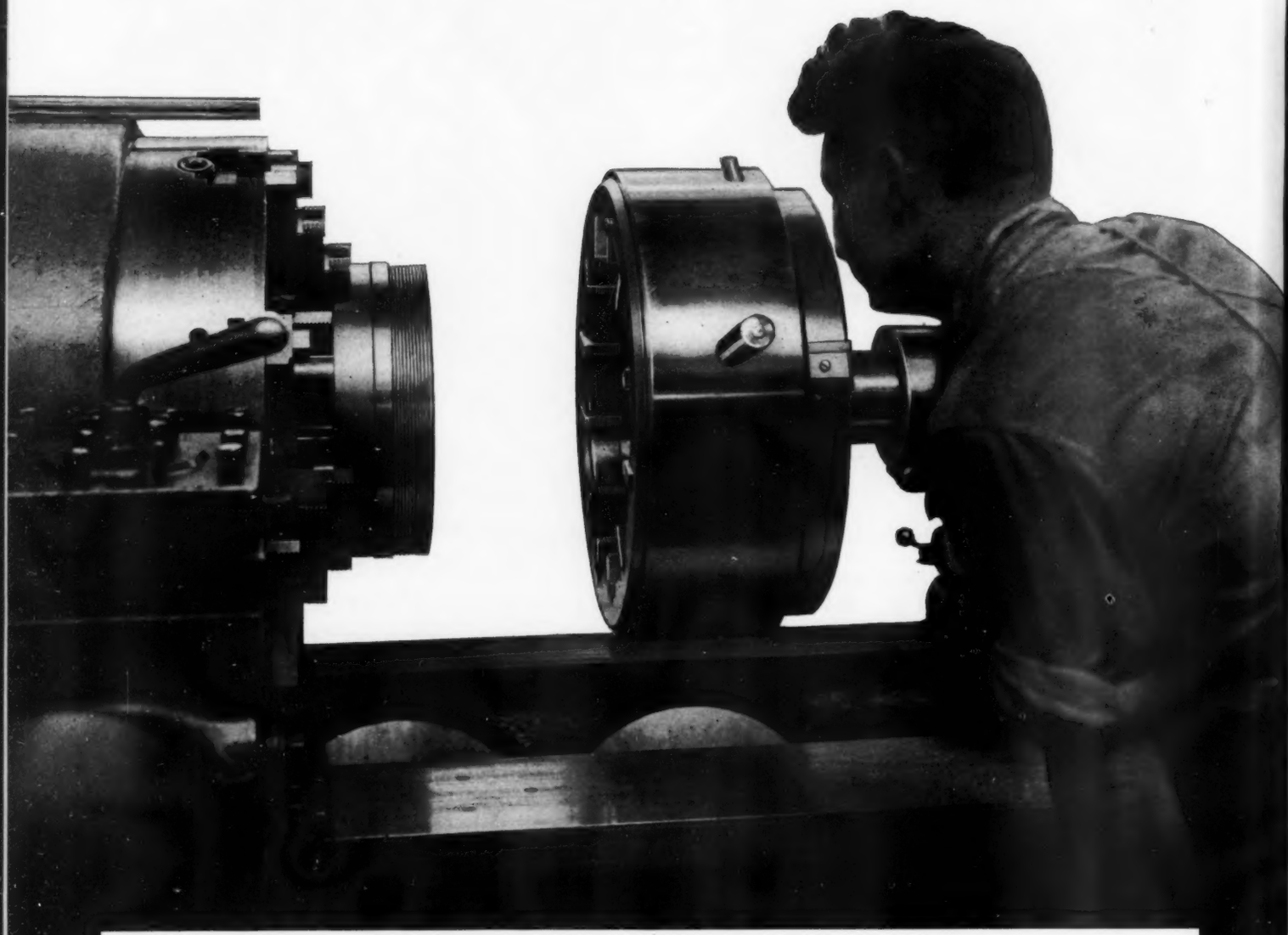
The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD., DETROIT · LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST., E.C.4

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

MODERN SELF-OPENING DIE HEADS



Whatever your threading problems are, you will find MODERN ready with a practical solution. The special 14" MODERN Self-Opening Die Head illustrated has a capacity from 10¾" to 14" and was made for a company who has had one in service for over 12 years and who has just duplicated the order.

Standard MODERN Stationary Type Self-opening Die Heads have a capacity from ⅛" to 7". They are described in Bulletin M-122—send for your copy.

CONSOLIDATED MACHINE TOOL CORPORATION

MODERN TOOL WORKS

DIVISION

ROCHESTER, NEW YORK

A GORTON Equipped TOOL ROOM

HOW SPECIALIZED TOOL ROOMS HAVE *Standardized with* GORTON MACHINES *Matched Equipment* ACCESSORIES

"Made for Each Other"

TO INCREASE *Accuracy and Output*

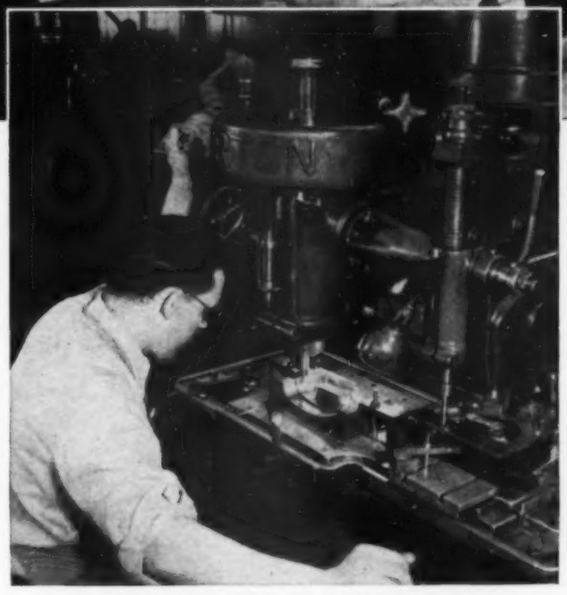
Where "*performance of the first machine determines selection of the second,*" a large manufacturer of molded products uses Gorton Super-Speed Milling Machines for producing and duplicating molds, and incidental jigs and fixtures for plastic molding.

This Gorton standardized installation is typical of many similar. A glance at the above photo shows the predominance of Gorton Machines. Closer inspection of this modern, efficient tool room, generally regarded as one of the finest and best equipped in the plastics industry, discloses that it is completely outfitted with Gorton time-saving Accessories—Vises, Circular Tables and Cutting Tools, etc.—a "Matched Equipment" installation, setting new standards of efficiency for high-speed spindle jobs.

Gorton Super-Speed Precision Machines and Accessories are increasing production and improving accuracy in Tool Rooms and Production Plants throughout the country. Perhaps they can also help you secure better results.

FREE DATA AND ENGINEERING SERVICE

Our engineers will be glad to make suggestions and recommendations on your high-speed milling, duplicating and pantograph work without obligation. Send for our complete catalogs covering all types of Super-Speed Vertical Milling, Duplicating and Pantograph Engraving Machines. Ask for complete set of catalogs.



ONE JOB IN BRIEF

TYPICAL of one of the many operations performed in the tool room shown above, is the machining of a cavity of a section of mold for producing plastic handles. A brief outline of the job is as follows:

MACHINE—Gorton 9-J Vertical Milling Machine.

PART—Section of Mold for producing plastic handles.

MATERIAL—Crucible Steel Co. CSM #2.

CUTTER—Right hand cut; right hand spiral ¼" end mill.

OPERATION—Machining out cavity of section for plastic handle. Molding section and master fastened on top of Duplicator Table.

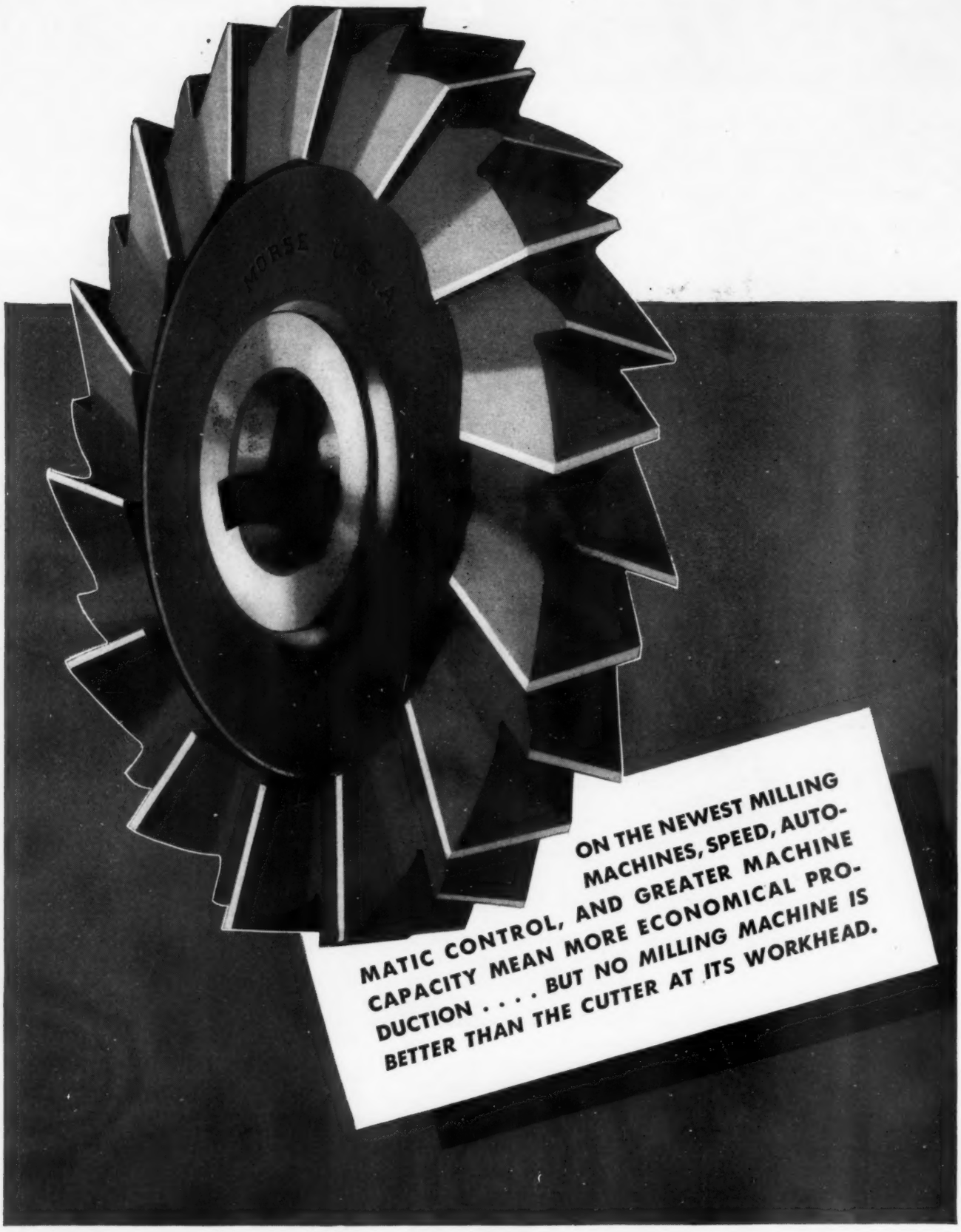
FEED—In this case the feed and speed, which naturally must be varied, are controlled by the operator.

CUSTOMER SAYS: "Through the use of the Gorton Machine, it is possible for the operator to cut very close to the required dimensions, thus reducing the amount of hand finishing to the minimum."

GEORGE GORTON MACHINE CO.

1315 RACINE STREET, RACINE, WISCONSIN, U.S.A.

49 Years — SPECIALISTS IN ENGRAVING, DIE MAKING AND SUPER-SPEED VERTICAL MILLING


MORSE
ON THE NEWEST MILLING MACHINES, SPEED, AUTOMATIC CONTROL, AND GREATER MACHINE CAPACITY MEAN MORE ECONOMICAL PRODUCTION . . . . BUT NO MILLING MACHINE IS BETTER THAN THE CUTTER AT ITS WORKHEAD.

MORSE

THERE IS A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

5-SPINDLE HEAD *Multiplies* SHELL OUTPUT

★ This new multiple spindle head designed and built by Kent-Owens mills all five staking notches in a typical shell at the same time. This method greatly multiplies production over the former method of milling one notch at a time. Both actual machining time and handling time are reduced to a fraction of that formerly required.

The fixture shown is designed so that shells are rolled on to it from an adjoining conveyor, completely notched, and then rolled back onto the conveyor. This unit can be adapted for use on either a Kent-Owens No. 1-8 Machine with hydraulic feed to the table, or the No. 1-M with hand feed.

Write for details.

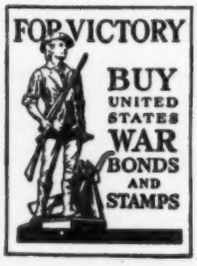
KENT-OWENS MACHINE CO., TOLEDO, O.

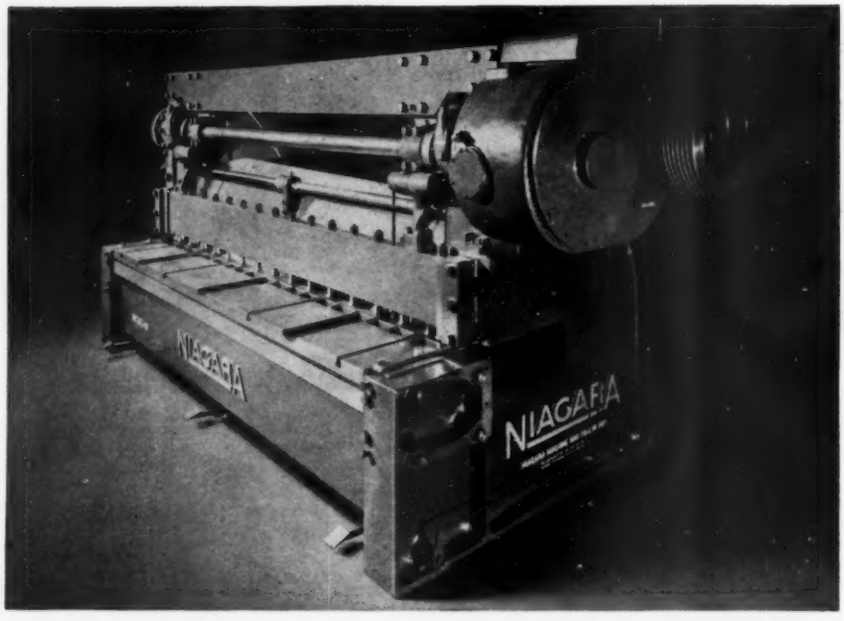
THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
eneral Machinery Corporation
BUFFALO
Don W. Patterson
CHICAGO
Neff, Kohlbusch & Bissell
DALLAS
amilton-Huster Machinery Co.
DAYTON
Gosiger Machinery Company
DETROIT
A. C. Haberkorn Machinery Co.
GRAND RAPIDS
Joseph Monahan
HOUSTON
Oliver H. Van Horn Co., Inc.
INDIANAPOLIS
Oatis-Booth Machinery Co.
KANSAS CITY
Eichman Machinery Co.
LOS ANGELES
Eccles & Davies Machinery Co.
Harron, Rickard, & McCone
MILWAUKEE
Neff, Kohlbusch & Bissell
MOLINE
John J. Normoyle Company
MONTREAL
F. F. Barber Machinery Co.
NEW ORLEANS
Oliver H. Van Horn Co., Inc.
NEW YORK
Wilson Brown Company
PHILADELPHIA
Calco Machinery Company
PITTSBURGH
Barney Machinery Company
ROCHESTER
F. W. Schiefer Machinery Co.
SAN FRANCISCO
C. F. Bulotti Machinery Co.
SEATTLE
Star Machinery Company
ST. LOUIS
Blackman & Nuetzel Machinery Co.
Clarke Equipment Company
SYRACUSE
J. F. Owens Machinery Company
TORONTO
F. F. Barber Machinery Company
WALKERVILLE
F. F. Barber Machinery Company

Call on KENT-OWENS *for Milling Machines*

Production of fighting and cargo ships is being speeded up in shipyards throughout America with the help of Niagara Power Squaring Shears. The Niagara JL-10 Shear shown at right cuts quarter inch plate at 60 strokes per minute. Instant acting Niagara sleeve clutch, ball bearing self-measuring parallel back gage, full visibility of the cutting line and convenient handling of sheets speed up squaring and trimming. Clutch and drive mechanism are mounted in an oil-tight case assuring perfect lubrication, long life and low maintenance cost. Niagara power squaring shears are built in a complete range of capacities and cutting lengths. Niagara Machine & Tool Works, Buffalo, N. Y. District Offices: Cleveland, Detroit, New York.





A Vital Message

TO EVERYONE USING MILLING CUTTERS WITH INSERTED BLADES

High speed steel is scarce. It is every shop man's duty to see that the supply on hand be used to the limit, and to see that all scrap is returned to the steel mills.

Lovejoy type "A" Milling Cutters were designed to utilize more than half the length of Lovejoy Blades. This is accomplished by Lovejoy's exclusive positive-locking device which holds short blades as rigidly as new blades. Be sure to take advantage of this feature — not only to help your costs and production, but also to help Uncle Sam.

When your Lovejoy Blades have been used to the limit, then order new blades out of our stock. Lovejoy High Speed Steel, Stellite, Rexalloy and Cemented-carbide blades in all standard sizes are ready for immediate shipment.

★

Often worn out Cemented-carbide blades may be salvaged by retipping — ask about this new Lovejoy service.

NEW
A new Lovejoy blade

SAVE
Still plenty of life left

SCRAP
Sell blades like this to Uncle Sam — he needs them

LOVEJOY
TOOL COMPANY, Inc.
SPRINGFIELD, VERMONT, U.S.A.

THE NICHOLS HAND MILLER

» A modern, convenient machine for the volume production of accurate parts . . . .

In the "NICHOLS", the usual features of the hand miller have been combined with a ruggedness of design and construction which makes it a truly production machine tool offering high cutting speeds, maintained precision and long life. A wide variety of operations can be handled at top speed and reduced cost as compared with the same work produced on larger slower machines.

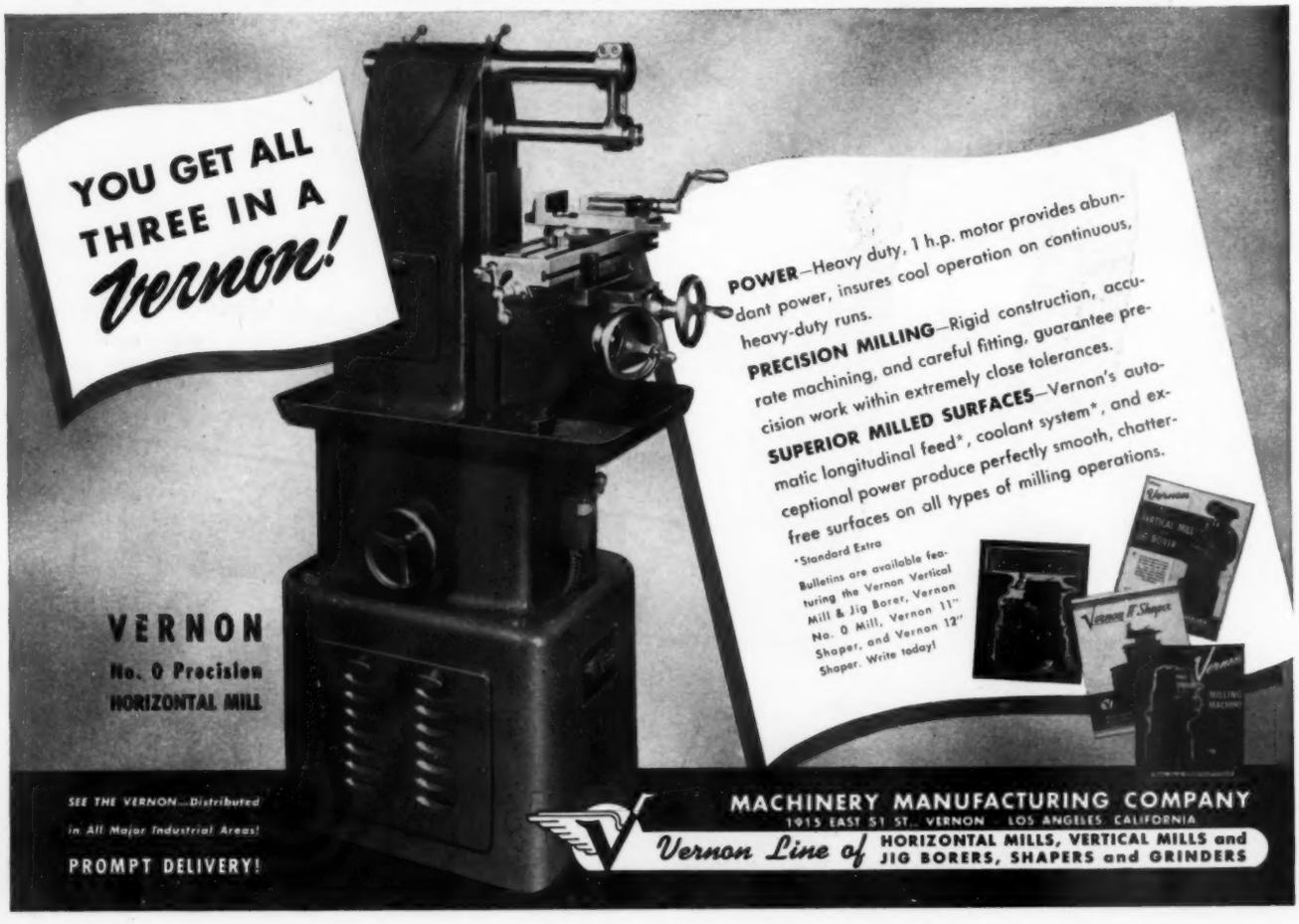
Because of its precision, great versatility and quick set-up, the Nichols Hand Miller is particularly adapted to tool room requirements. Its wide use in this class of service by leading manufacturers is evidence of its recognized value and suitability in meeting the requirements of modern shops.

•

Capacity: Longitudinal Feed, 10"; Transverse Feed, 7"; Vertical Feed of Knee, 13½"; Vertical Movement of Head, 4½", Working Surface of Table, 6½" x 21"; Spindle Speeds, 100, 200, 600 and 1200 R.P.M.

Send for Illustrated Bulletin giving Complete Information

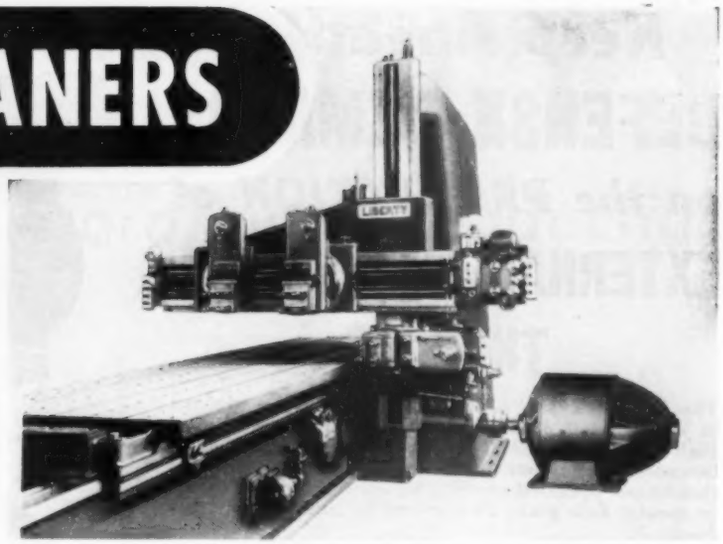
W. H. NICHOLS & SONS *Waltham, Mass., U.S.A.*


YOU GET ALL THREE IN A Vernon!
VERNON
No. 0 Precision
HORIZONTAL MILL
POWER—Heavy duty, 1 h.p. motor provides abundant power, insures cool operation on continuous, heavy-duty runs.
PRECISION MILLING—Rigid construction, accurate machining, and careful fitting, guarantee precision work within extremely close tolerances.
SUPERIOR MILLED SURFACES—Vernon's automatic longitudinal feed*, coolant system*, and exceptional power produce perfectly smooth, chatter-free surfaces on all types of milling operations.
*Standard Extra
Bulletins are available featuring the Vernon Vertical Mill & Jig Borer, Vernon No. 0 Mill, Vernon 11" Shaper, and Vernon 12" Shaper. Write today!
SEE THE VERNON—Distributed in All Major Industrial Areas!
PROMPT DELIVERY!
MACHINERY MANUFACTURING COMPANY
1915 EAST 51 ST., VERNON LOS ANGELES, CALIFORNIA
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

LIBERTY PLANERS

A TYPE and SIZE for every REQUIREMENT

▲ ▲ ▲

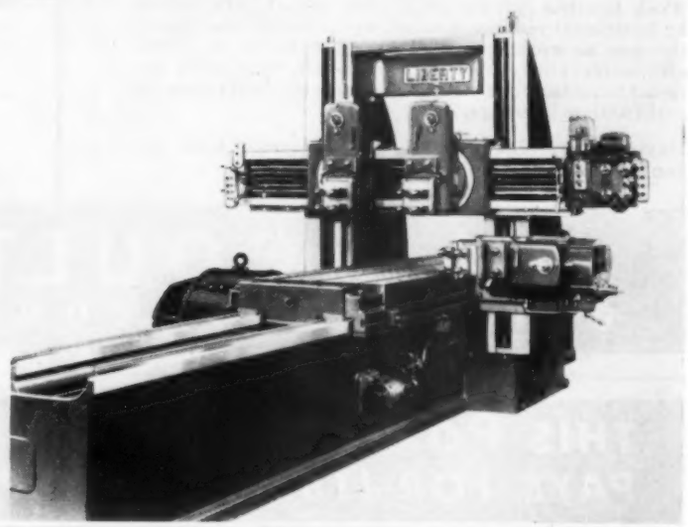


LIBERTY Open Side

Designed and built to accommodate work of variable widths this sturdy planer has a wide faced housing and motorized clamp insuring rigidity for heavy cuts and smooth, accurate finishing.

Open Side Standard Design
24"—30"—36"—42" and 48" sizes

Open Side Heavy Duty Design
36"—42"—48"—54"—60" and 72" sizes.



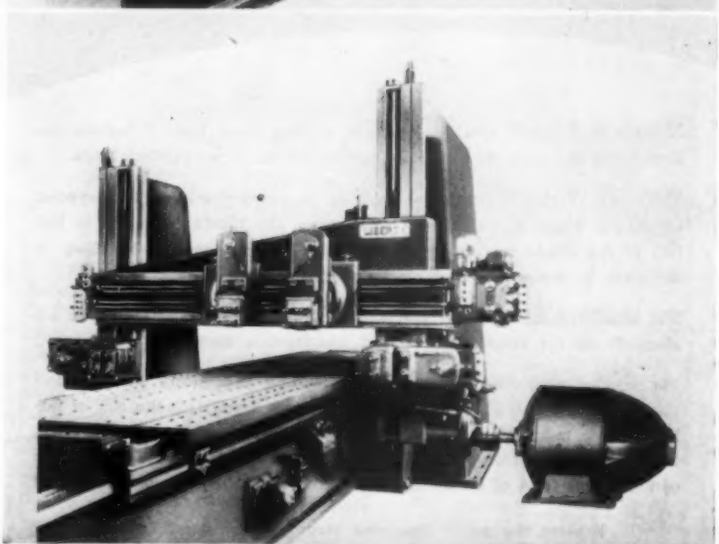
LIBERTY Double Housing

Developed to handle high production of work within a well defined range. Rigidly constructed, accommodates one, two, three or four heads and handles precision work, with maximum cutting feeds and speeds.

Double Housing Standard Design
22"—24"—30"—36"—42" and 48" sizes

Double Housing Medium Duty Design
48" with 12', 16' or 20' Tables

Double Housing Heavy Duty Design
36"—42"—48"—54"—60" and 72" sizes



LIBERTY Convertible Type

This Convertible Planer combines the versatility of the Open Side with the rigidity of the Double Housing type. Left housing moves in and out permitting use of side heads on narrower work than with a Double Housing machine of similar capacity.

Standard and Heavy Duty Convertible Type Planers are built in the same sizes as the Open Side Planers but with rails widened to give as much as 12'—0" between housings.

Consult our nearest representative or factory direct for specific information on planers. Write for Catalog No. 152, 153 and 154.

LIBERTY PLANERS

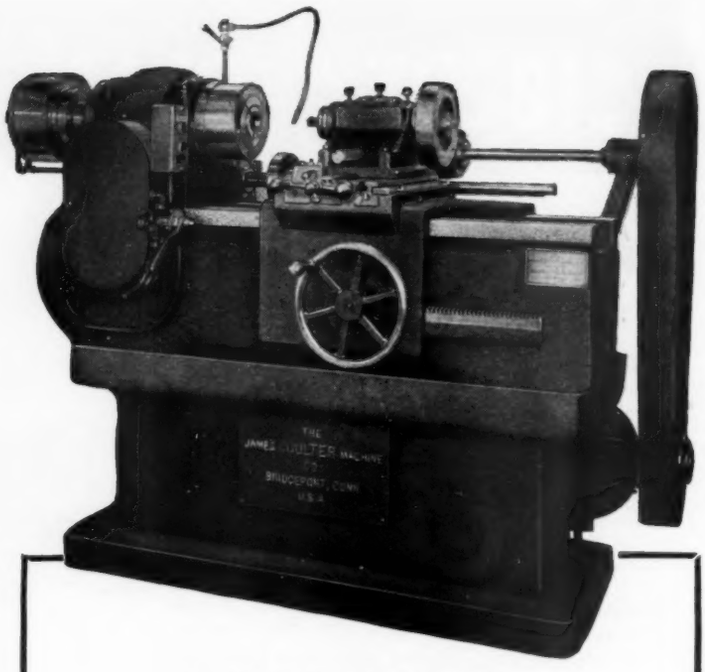
1006 WELLER AVENUE HAMILTON • OHIO

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL
THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER Machine Co.
BRIDGEPORT • CONNECTICUT • U.S.A.

THIS PORTER-McLEOD CUTTING OFF MACHINE *PAYS FOR ITSELF* IN STEPPED-UP PRODUCTION

If your cold metal sawing involves cutting stock from 3 inches up, here's the machine to put such operations on a production basis.

This new Porter-McLeod 8" machine is particularly advantageous on larger sizes of stock. *By supporting the blade close up to the* rim of the blade and *pulling* the blade through the cut, buckling of the saw is prevented and accuracy maintained.

The standard feed of this machine is 3 inches a minute but can be stepped up for cutting brass and non-ferrous metals.

Because of the great leverage exerted on the blade through the Porter-McLeod Pull Method of Drive and the support at the rim of the blade, this machine requires less power and assures a straight cut. Multiple units can be cut at one time on the Porter-McLeod by means of the upper feed of the machine which permits nesting of bars.

Explore the great time and money-saving possibilities offered by this modern production cutting off machine. Investigate *NOW* by sending for complete details.

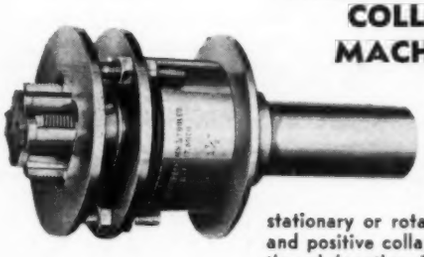
PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U. S. A.

MACHINE TOOL COMPANY

Tool up with MURCHEY *for faster threading in ordnance production*

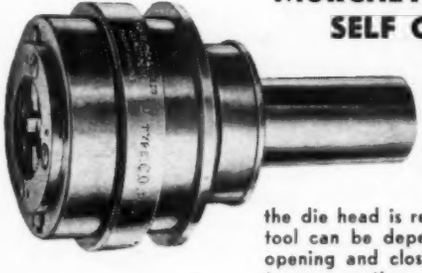
In shops handling war work, Murchey Threading Tools are meeting every demand for faster, more accurate thread production.

It will pay you to get in touch with Murchey to help you attain and maintain the maximum in production threading.



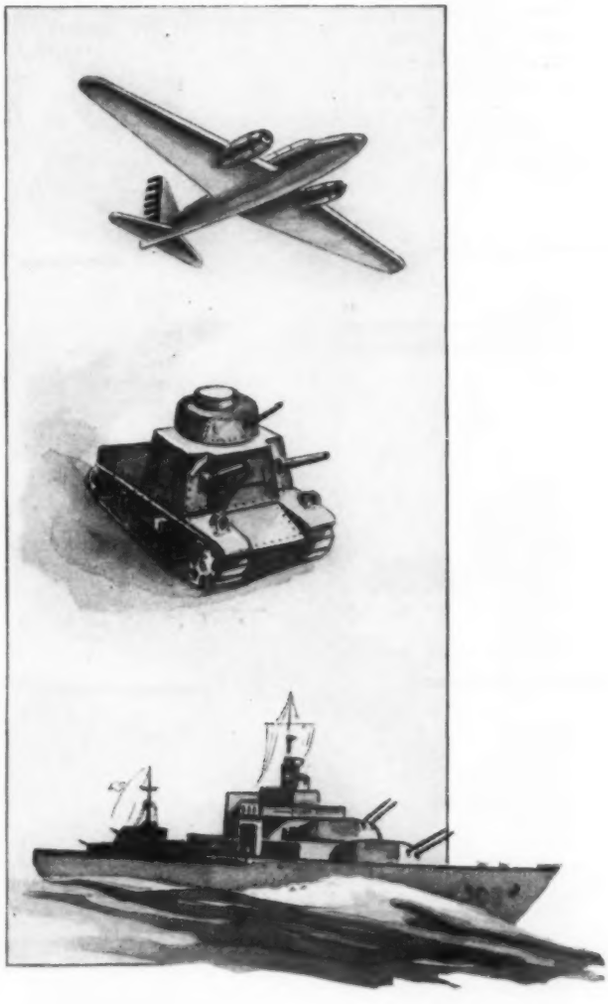
MURCHEY TYPE "M" COLLAPSIBLE MACHINE TAP

This universal tool—designed for fast, accurate production of straight threads—can be furnished for use on either stationary or rotating spindles. Instant and positive collapsing assures accurate thread lengths. Thread size is adjustable. Every detail assures sturdiness, strength, dependability and low cost thread production.



MURCHEY TYPE "CO" SELF OPENING DIE HEAD

Simple and sturdy in construction, the Type "C-O" is designed for use on any machine where the die head is revolved. This Murchey tool can be depended on for positive opening and closing as well as instantaneous action. It assures accurate thread length. Long life and accurate performance on production runs are also assured because all parts are hardened and ground.



Murchey also manufactures

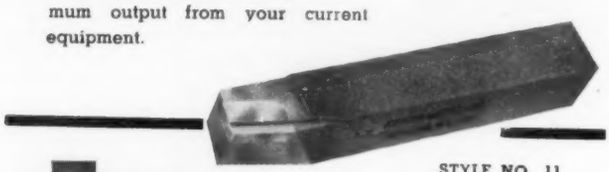
Thread Milling Machines, and Shell Tapping Machines. Write for detailed information.

Murchey MACHINE & TOOL CO.
.....DETROIT, MICHIGAN

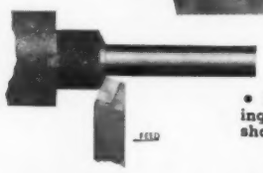
KENNAMETAL*—
The Sensational Cutting Tool of *World War II*

KENNAMETAL THE All American CARBIDE

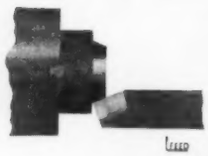
• Illustrations below show the correct applications of the most widely used styles of KENNAMETAL Carbide Tools. Standardize on these ruggedly designed KENNAMETAL tools and get maximum output from your current equipment.



STYLE NO. 11

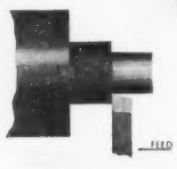


• Style 11 is for rough turning or where a square shoulder is not required.

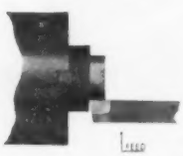


• Style 12 is for rough facing or large boring, where a square shoulder is not required.

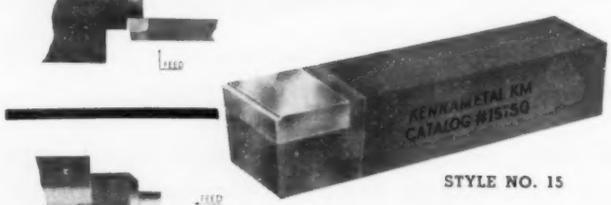
STYLE NO. 3



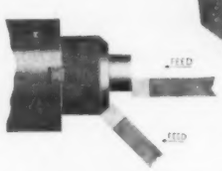
• Style 3 is for turning to a square shoulder.



• Style 6 is for facing or large boring to a square shoulder.



STYLE NO. 15



• Style 15 is for facing and chamfering, or may be used for turning or facing.

• For greater production on your boring, turning, and facing operations use KENNAMETAL tools.

Write for the Vest Pocket Manual which gives complete information about this superior cutting carbide.

McKENNA METALS Co.
103 LLOYD AVE., LATROBE, PA.
Foreign Sales: U. S. STEEL EXPORT CO. 30 Church St. New York
Exclusive of Canada and Great Britain

SHELDON Back Geared Screw Cutting PRECISION LATHES

FOR THE TOOL ROOM

The finest 10", 11" and 12" lathes ever built in the moderate price field. Large special analysis steel spindles GROUND ALL OVER, with extra collet capacity. Hand-scraped Bronze, Ultra-Precision Ball or Super-Precision Roller spindle bearings, (the finest bearing obtainable). Heavy braced, semi-steel beds with hand scraped ways (2 V-ways and 2 flat ways). These lathes come with a choice of aprons, gear boxes, and drives including the anti-friction, 4-speed, V-belt Lever-operated pedestal base motor drive illustrated. Telescopic Taper Attachment and other accessories available.

FOR PRODUCTION

Lathes with lever operated collets, lever cross slides and tailstocks. Ideal for second operation work—sturdily built precision tools.

FOR MACHINE SHOP

and maintenance department lathes, with a wide choice of attachments, accessories and drives.

Write for Catalog

Just out "The Care and Operation of a Lathe" to help apprentice training. 50¢ list price, discounts for quantity purchases.

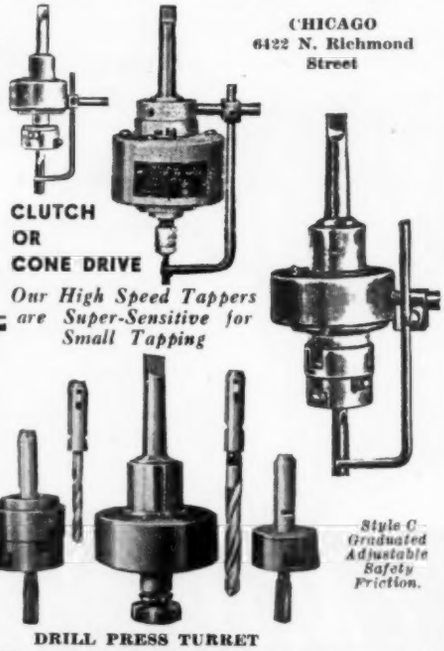
SHELDON MACHINE CO., INC.
4234 N. Knox Ave. Chicago, U. S. A.

ERRINGTON
Main Office and Works, Stapleton, Staten Island, N. Y.
TAPPING CHUCKS

NEW YORK
170 Broadway

BOSTON
830 Old South Bldg.

CHICAGO
6422 N. Richmond Street



CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down.

Style C Graduated Adjustable Safety Friction.

DRILL PRESS TURRET

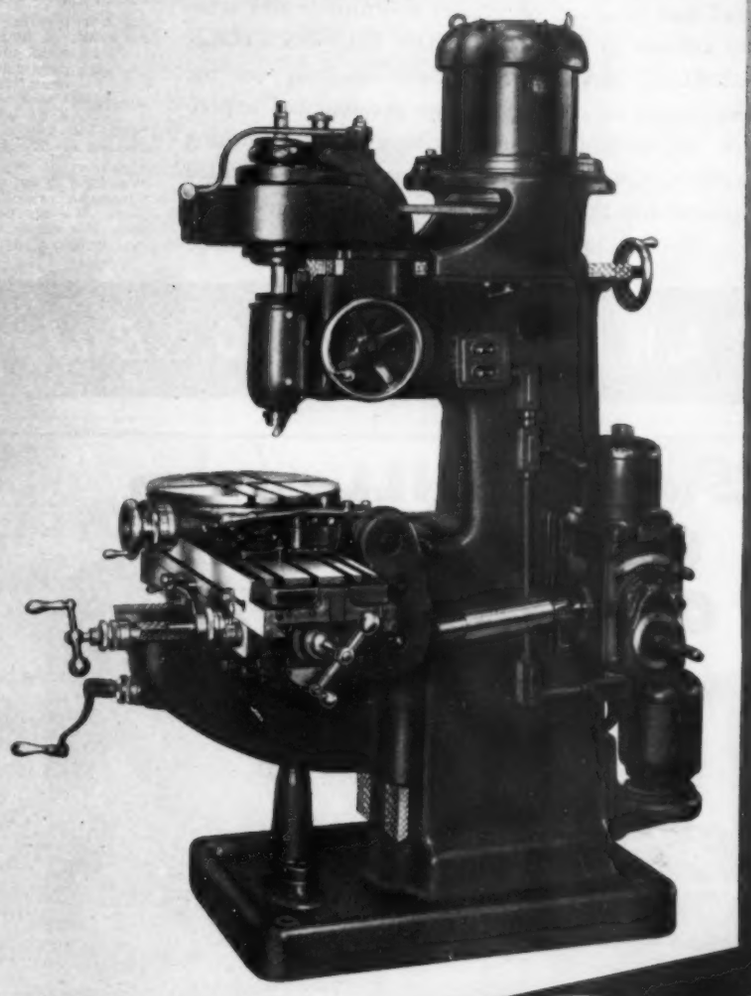
Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder, if required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

PROMPT DELIVERY!

REED-PRENTICE
No. 3VG VERTICAL MILLER

Reed-Prentice Corporation is able to offer prompt delivery of its No. 3VG Miller. This recently improved milling machine is highly regarded in the general manufacturing field. This is especially true in the case of manufacturers of gun and aircraft engine parts as well as with manufacturers engaged in die and tool making. Three ranges of spindle speeds are available within a minimum of 100 RPM and a maximum of 4000 RPM. Duplicator equipment for irregular contour or profile milling can be supplied.



SPECIFICATIONS

Longitudinal Feed (Power)	24"
Cross Feed	12"
Vertical Adjustment of Knee	18"
Vertical Adjustment Head on Column	5"
Max. Distance, Spindle to Table	18"
Max. Distance, Spindle to Frame	16"
Rotary Table, working surface	16½"
Machine Table, working surface	10¼" x 36"

ARMY E NAVY

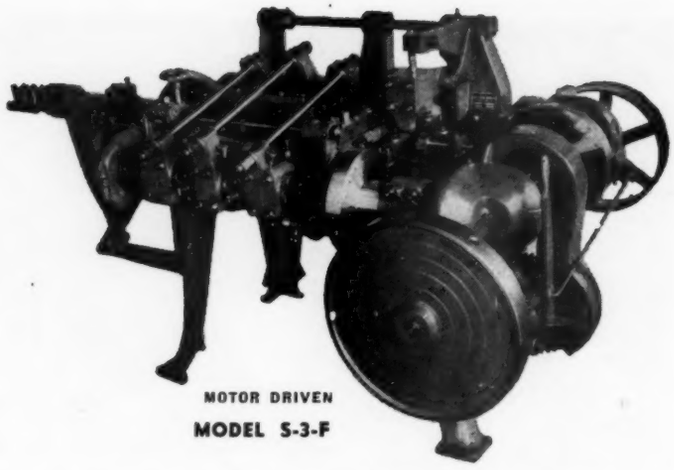
REED-PRENTICE CORPORATION 1213 W. 3d St., CLEVELAND, OHIO
75 WEST ST., NEW YORK CITY
WORCESTER, MASSACHUSETTS, U.S.A.

STEP UP PRODUCTION OF FORMED PARTS

. . . with the

NILSON AUTOMATIC METAL and WIRE FORMING MACHINES

Today's requirements for higher efficiency, greater speed and products of greater uniformity and accuracy are met in the new NILSON RIBBON STOCK FORMING MACHINES. These machines are the achievement of over fifty years accumulated experience in designing and building metal forming machines. Careful selection of materials and skilled workmanship result in machines that are famous for long life and low maintenance.



MOTOR DRIVEN
MODEL S-3-F

FEATURES THAT CONTRIBUTE TO BETTER, FASTER WORK

Superior features of the NILSON four-slide forming machines are the result of long experience and include:

. . . open construction of press and forming tools.
. . . patented slide feed which has an independent cam-operated wire gripping device.
. . . transmission of power operating wire feed through a straight line.

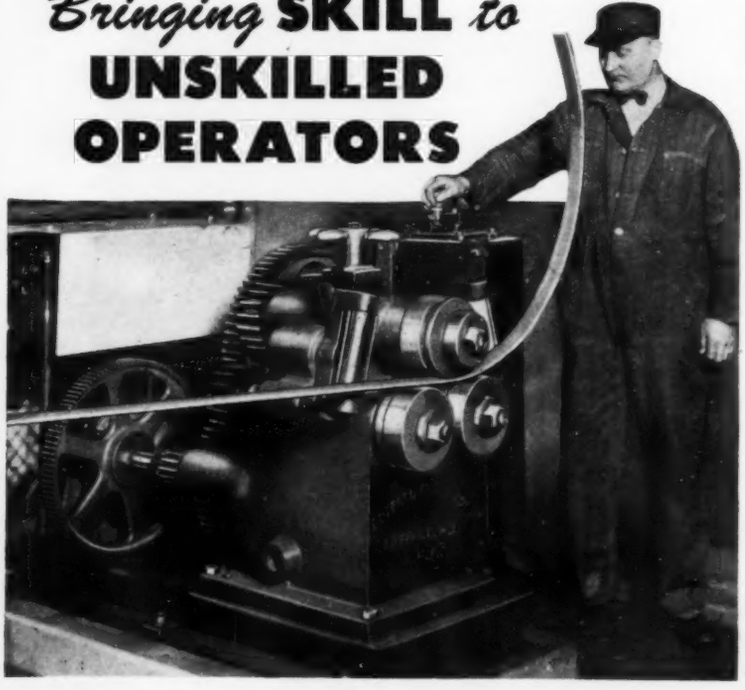
Send for 4-page circular giving further information as well as detailed specifications of sizes and capacities.

• •

We have been engaged in the design and production of special automatic machinery of high production capacity for over thirty years. We are prepared to render a complete service in connection with the design and production of automatic machinery of every description. Consult Nilson on your requirements.

THE A. H. NILSON MACHINE CO... *Bridgeport, Conn., U.S.A.*

Bringing SKILL *to* UNSKILLED OPERATORS



• Skill is built right into Buffalo Bending Rolls. That's why — even with unskilled workers — a wide variety of circular forms can be turned out swiftly and accurately with these husky production machines. Buffalo Bending Rolls are constructed for the heaviest bending operations — rings, arcs and spirals with many types of stock — and their ease of operation insures maximum output on a 24-hour-a-day schedule.

BUFFALO FORGE COMPANY

448 Broadway Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd.
KITCHENER, ONTARIO

"Buffalo" **BENDING ROLLS**

Measure production by the "New Series"
STANDARDS

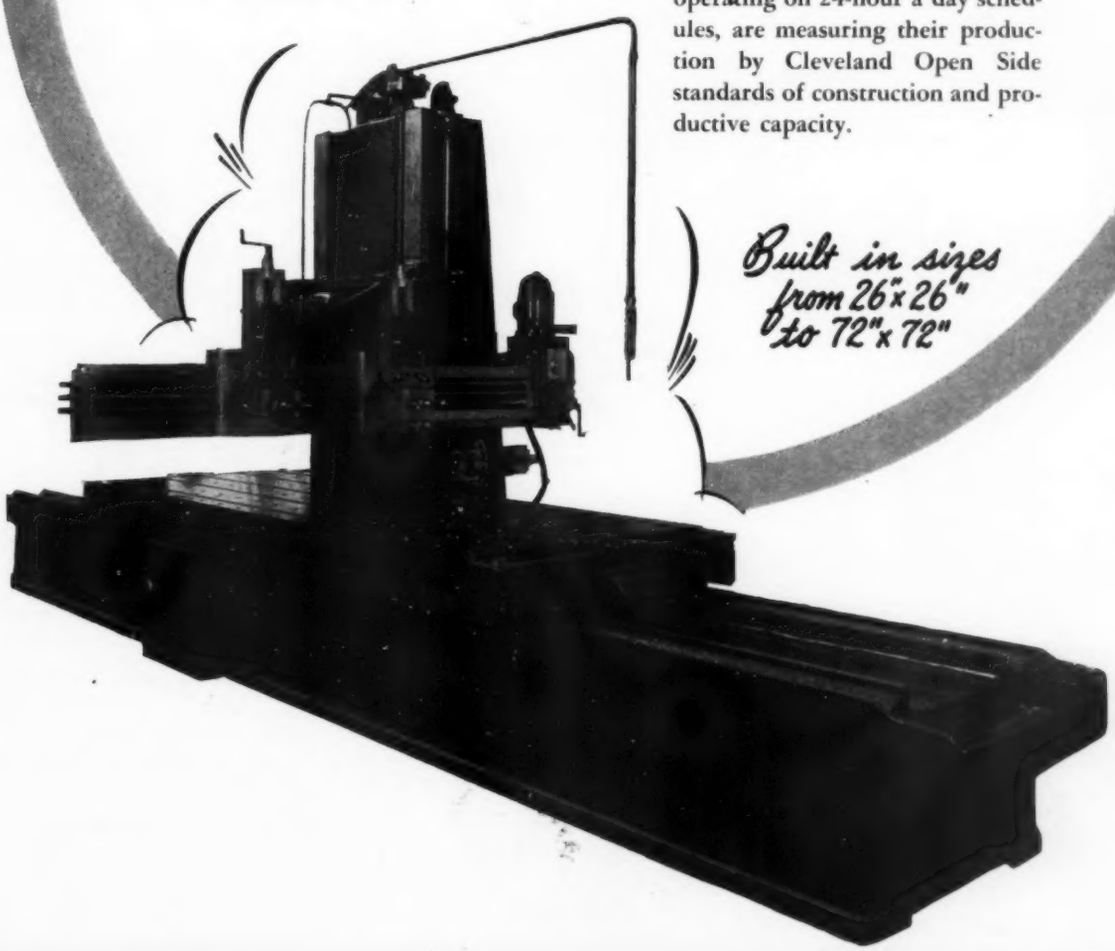
CLEVELAND *Open Side* PLANERS

With production sights set on War objectives a host of manufacturers are meeting extremely heavy schedules with Cleveland Open Side Planers.

Versatility an inherent characteristic of Cleveland Open Side Planers is given additional productive capacity by particularly sturdy construction and modern design.

As an example of sturdier construction—Beds, Columns, Tables and Knees are of special nickel chrome semi-steel castings. Table Rack—Rail and all Heads are made of a special iron possessing high tensile strength and unusual resistance to fatigue and impact.

That's why Tank Plants, Airplane Factories and Shipbuilding yards, operating on 24-hour a day schedules, are measuring their production by Cleveland Open Side standards of construction and productive capacity.



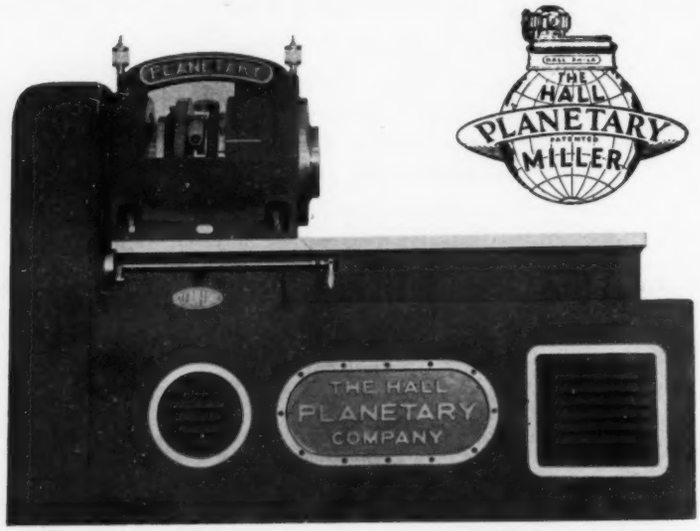
Built in sizes from 26"x 26" to 72"x 72"

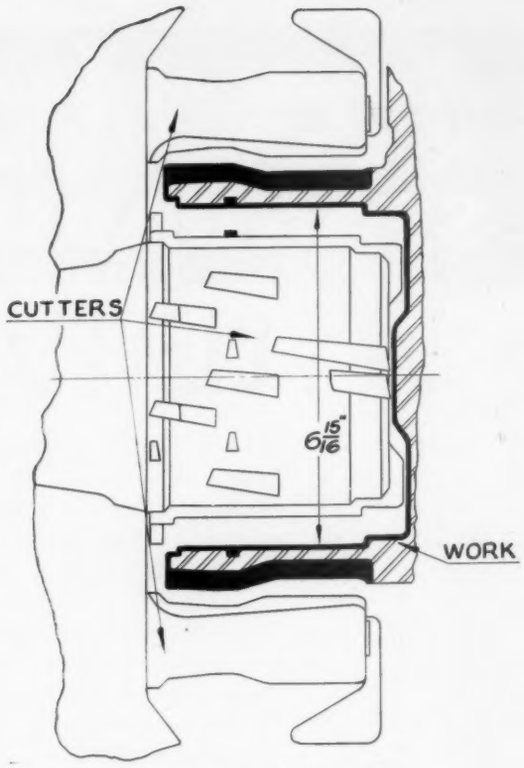
THE CLEVELAND PLANER
3148-3156 SUPERIOR AVE., CLEVELAND, OHIO

Production

Propeller Hub Arms — 15 minutes each, rough or finish operations. Internal and external simultaneously. Accuracy well within requirements.

Send us your prints.





Send us prints for details

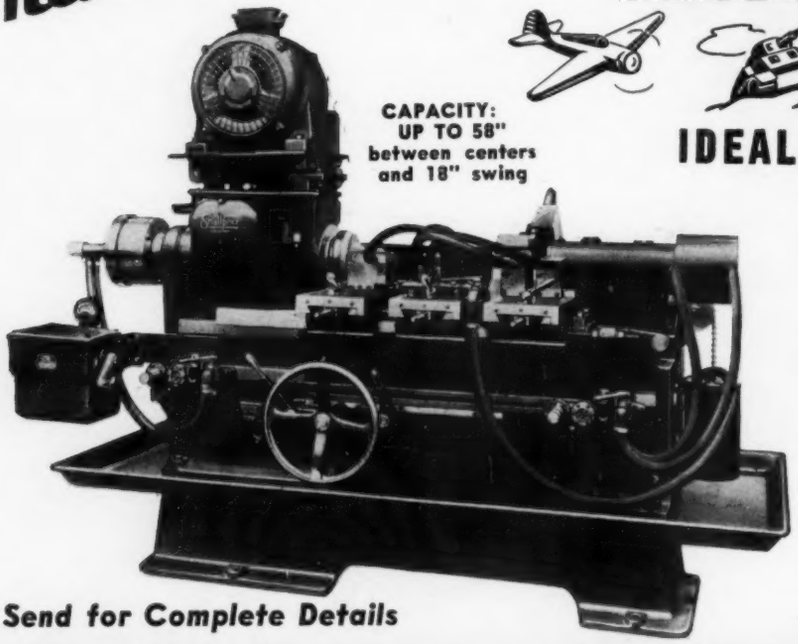
THE HALL PLANETARY COMPANY

Fox Street and Abbotsford Avenue

PHILADELPHIA, PA.

Reid-Smallpeice

REID-SMALLPEICE MULTI-TOOL PRODUCTION LATHES



CAPACITY: UP TO 58" between centers and 18" swing

IDEAL FOR ARMAMENT WORK

This machine is extremely valuable for use in tool room or production because it can be quickly changed over into a single purpose automatic by means of attachments and slides. Swing from one job to another can be made quickly and easily, a versatility which means time and space savings for any one busily engaged in armament work.

Ability to handle a wide range of operations on a single machine means that production can move along steadily without the delays incident to obtaining additional machine tool equipment.

TYPICAL USES

Shells, Shafts, Gears, Rotors, Valves, Pistons, Cylinders, Crankshafts.

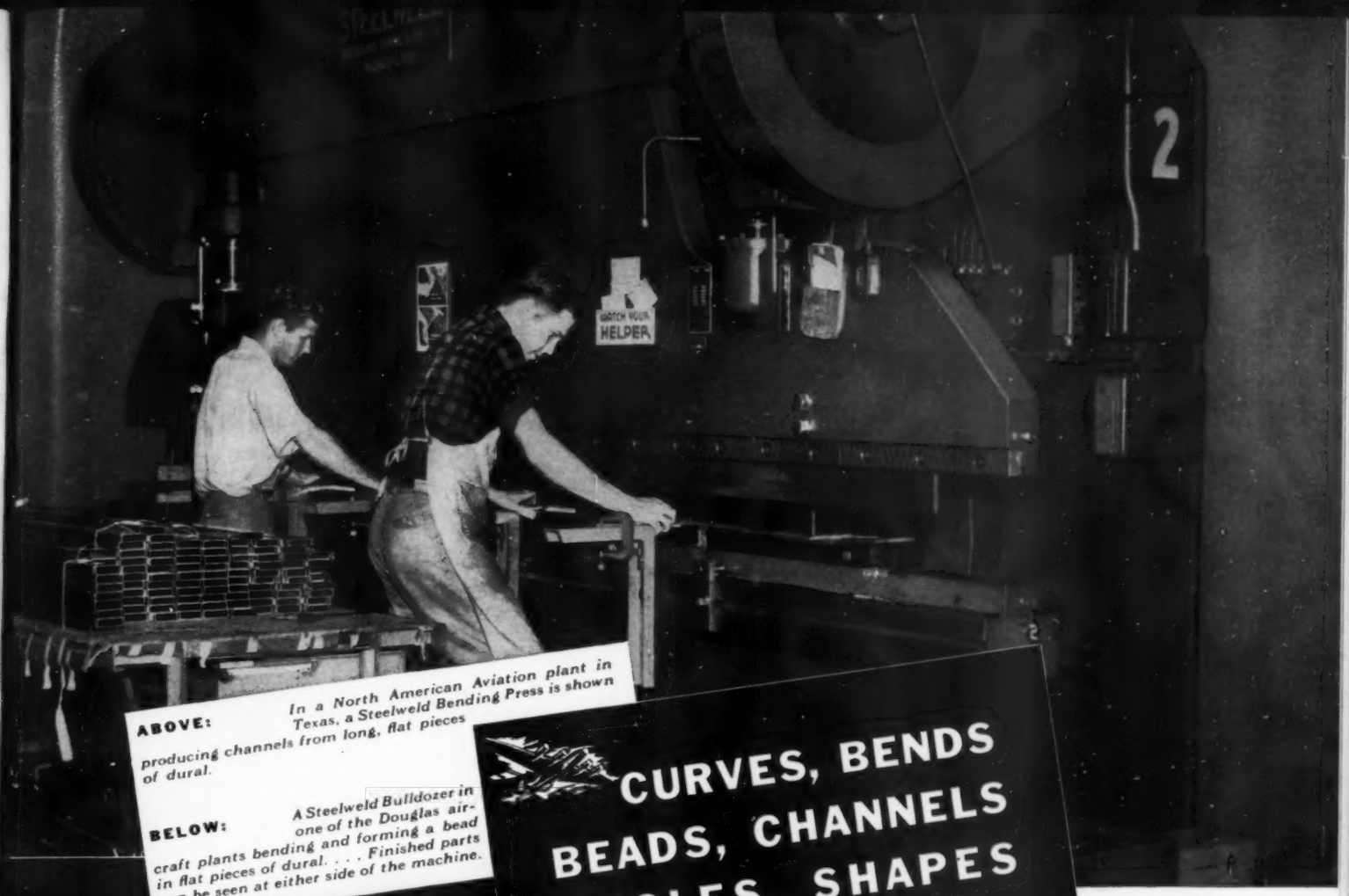
BUILT IN TWO SIZES

	6 W.S.L.	9 W.S.L.
Swing over bed	12"	18"
Between Centers	18"	22"
Admits between centers (long bed)	30"/42"/54"	40"/58"
Spindle Speeds	10	8
Floor Space	5'3"x3'0"	7'8"x4'10"

Send for Complete Details

REID BROTHERS, INC. MANUFACTURERS IN UNITED STATES **Beverly, Massachusetts**

SMALLPEICE, LTD., Ellwood L. Houtz, Agent



ABOVE: *In a North American Aviation plant in Texas, a Steelweld Bending Press is shown producing channels from long, flat pieces of dural.*

BELOW: *A Steelweld Bulldozer in one of the Douglas aircraft plants bending and forming a bead in flat pieces of dural. . . . Finished parts can be seen at either side of the machine.*

CURVES, BENDS BEADS, CHANNELS ANGLES, SHAPES

STEELWELD Forms Them All for Fighting Planes!

In aircraft plants throughout the nation Steelwelds are speeding the fabrication of parts for every type of plane. Complex bends and curves, channels, beads, angles and shapes are quickly produced in dural and other metals measuring up to 20 feet in width. When small quantities of parts are needed, Steelweld design permits quick change of dies.

Steelweld precision-built presses — powerful, rugged and accurate—are serving the needs of war production on jobs that range from delicate aircraft operation to the straightening of heavy heat-treated armor plate, performing unfailingly under the severest conditions of constant operation.

THE CLEVELAND CRANE & ENGINEERING CO.
STEELWELD MACHINERY DIVISION
1127 EAST 283RD STREET • WICKLIFFE, OHIO.

MANUFACTURERS OF • CLEVELAND CRANES • CLEVELAND TRAMRAIL • STEELWELD BENDING PRESSES

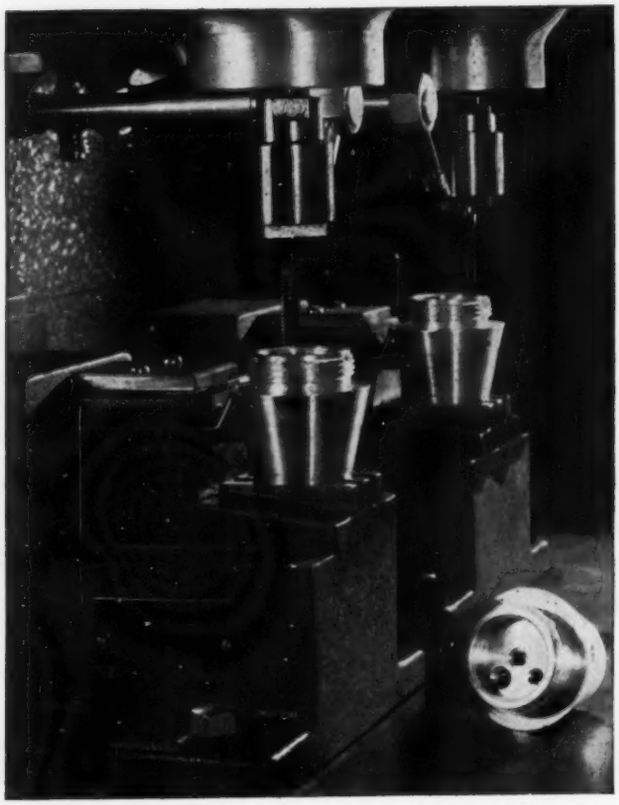
GET THIS BOOK!

CATALOG No. 2002 gives complete construction and engineering details. Mail request for free copy on your company letterhead.

STEELWELD
BENDING PRESSES

GENERAL SALES AGENTS: CYRIL BATH & CO., E. 70TH & MACHINERY AVE., CLEVELAND

After the Emergency ... What?

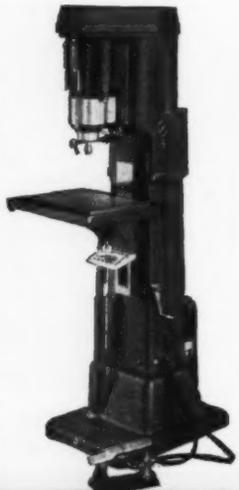


Tooled today for war time aluminum fuse bodies, this *standard* Haskins Tapper can quickly and inexpensively be changed over to peace time production needs.

It's natural today to think of machinery in terms of *immediate* output. But when the war's over—what then?

That is when the *lasting* quality of really fine equipment will pay its greatest return.

Haskins Tappers bought today for war time production are *standard* machines. A few quickly made adjustments—perhaps an inexpensive fixture change—and your Haskins Tappers will be ready to help you hold *down* peace time production costs—so that you can keep sales and profits *up!* R. G. Haskins Company, 2761 W. Flournoy Street, Chicago.



WRITE FOR BOOKLET—"Holding Fixtures for Haskins Tapping Machines." Contains many new ideas.

HASKINS

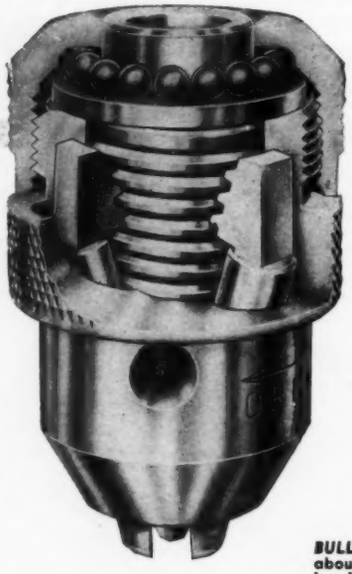
HASKINS *Precision* TAPPING EQUIPMENT

MEMO

To Shop Foremen about Ettco-Emrick KEYLESS DRILL CHUCKS

If you are using Ettco-Emrick Drill Chucks, we don't have to tell you what sturdy, well-made tools they are and what excellent service they give. Nor do we have to tell you what a big advantage the **keyless** feature is, especially for women operators because it takes no strength to tighten the chucks.

You know, too, that you don't have to baby Ettco-Emrick Drill Chucks and that they can take a lot of punishment. But it's vital now to make tools last as long as possible. So we suggest you save these chucks from unnecessary abuse, particularly at the hands of inexperienced men and women operators, by passing on to them the following few DON'TS.



DON'T use a wrench or hammer to tighten these chucks. Remember they are **keyless.** Drilling action does the tightening.

DON'T fail to insert the drill shank full length into the chuck.

DON'T run the chuck jaws into the work.

DON'T use a wrench or hammer to remove the chuck from drill press spindles—always use a drift pin.

DON'T attempt to take the chuck apart without knowing exactly how to do it. When in doubt call or write and we'll tell you the right way.

BULLETIN No. 6 **gives full details about these time and energy saving Keyless drill chucks. Write for a copy today.**

Ettco-Emrick KEYLESS Drill Chucks are also stocked to fit all makes of portable electric drills.

ETTCO TOOL CO.

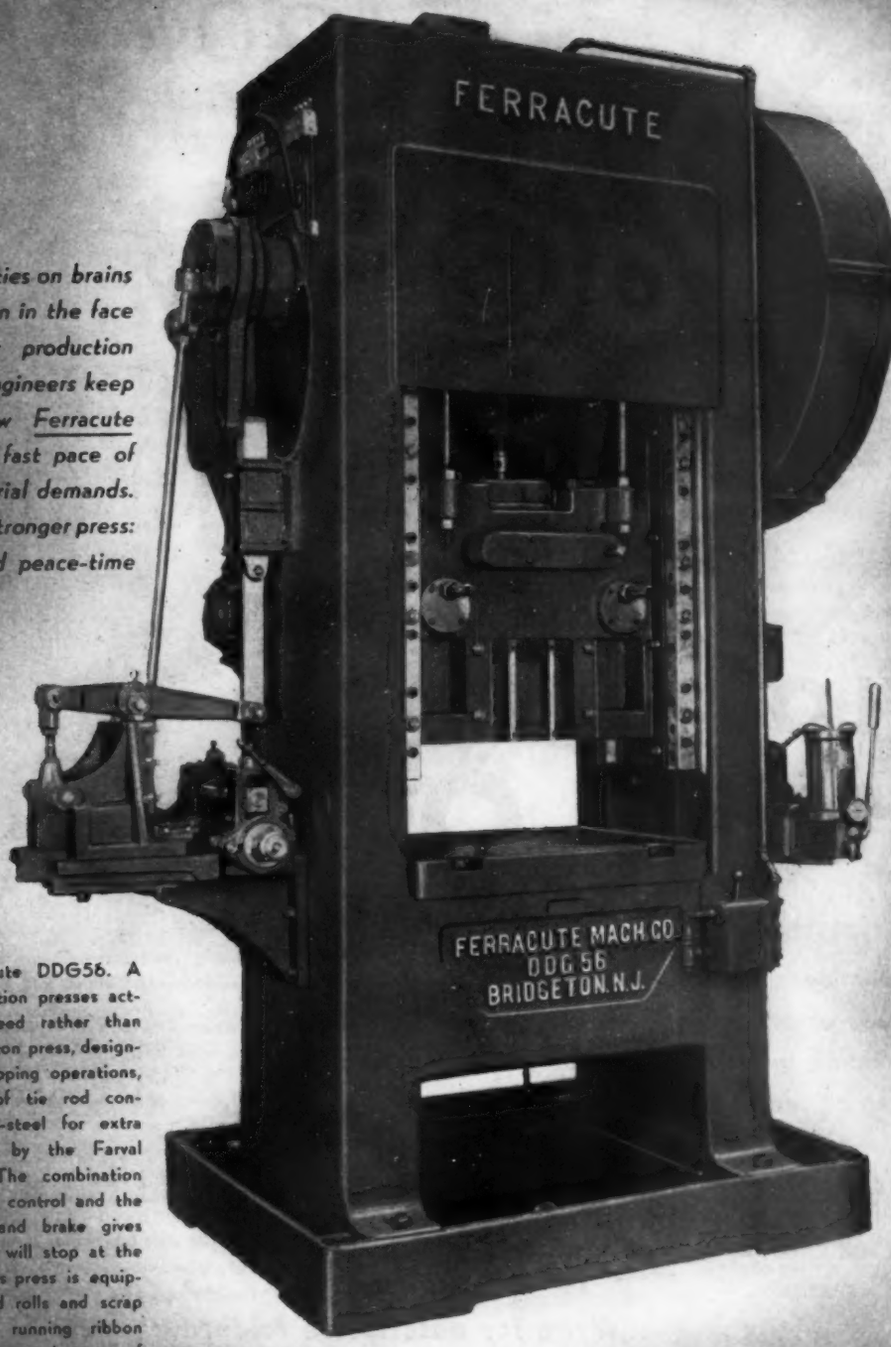
590 Johnson Ave., Brooklyn, N. Y.

Detroit Chicago

The Famous Ettco-Emrick DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

SPEED-STRENGTH-
A FERRACUTE

There are no priorities on brains and ingenuity. Even in the face of an all-out war production drive, Ferracute engineers keep ahead with a new Ferracute press to meet the fast pace of the nation's industrial demands. A faster press—a stronger press: for victory now and peace-time production later.



A new press—Ferracute DDG56. A new series—double action presses actuated by cam for speed rather than crank shaft. This 100 ton press, designed for blanking and cupping operations, is a rugged machine of tie rod construction cast of semi-steel for extra strength. Lubrication by the Farval Centralized system. The combination of low pressure cut-off control and the Ferracute air clutch and brake gives assurance that the ram will stop at the top of the stroke. This press is equipped with double feed rolls and scrap cutter for use when running ribbon stock—one man can run a battery of these presses.

PRESSES and PRESS BRAKES

FERRACUTE **FERRACUTE MACHINE COMPANY** FERRACUTE

Bridgeton, New Jersey, U.S.A.

Get More Production

SAVE VALUABLE FLOOR SPACE

TAYLOR-WILSON
Cutting-Off Machine

Taylor-Wilson Machines are finding many new uses in the war production program. For example, they are saving hundreds of productive hours in the cutting of Bomb Blanks, doing the work faster, more economically and with unerring accuracy. Like results are being achieved in the cutting of Roller Bearing Blanks, Coupling Stock, etc.

The machines will cut tubing made of all grades of steel including N-80 seamless.

Made in six sizes. Each machine has a wide range making unnecessary the installation of a battery of machines—and conserving floor space.

Cutting-Off Tools are hydraulically driven permitting unlimited flexibility in range of speed of cutting.

All gears and bearings are lubricated by motor driven circulating system which strains the oil before circulating.

Only one man is required to operate the machine.

Rugged cast iron frame, and perfectly adjusted heavy-duty parts, provide extra sturdiness and assure vibrationless operation.

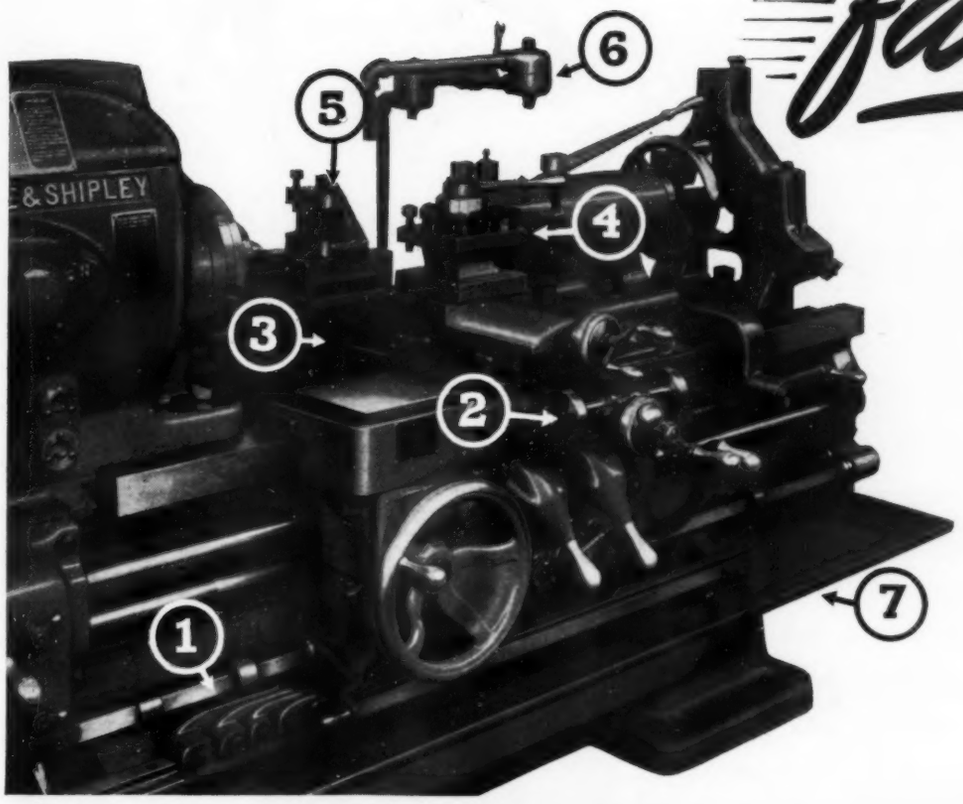
Write for descriptive folder

TAYLOR-WILSON MFG CO.

35 Thomson Ave., McKees Rocks, Pa.

PITTSBURGH DISTRICT

Produce SMALL Lots *faster*



Awarded Navy "E"
March 6, 1942

Why you save time with The Lodge & Shipley Manufacturing Lathe

Change over quickly and easily from one job to another.
Advantageous use of multiple tools and universal holders.
Transfer of diameter and length control from operator to lathe.

OUTSTANDING FEATURES

(1) Multiple Length stops (Telescopic Dog Type), automatically disengage longitudinal feeds.

(2) Multiple Diameter Stops, for both front and rear tools, can be quickly indexed for establishing diameters. Time wasting "cut and try" eliminated.

(3) Connected rear rest increases tooling possibilities. Adaptable to single or multiple tools.

(4) Four-way tool block on compound rest can be indexed for twelve equally spaced tool positions.

(5) High duty tool block in rear used for single tool can be supplemented or replaced with multiple holder.

(6) Coolant pump and piping.

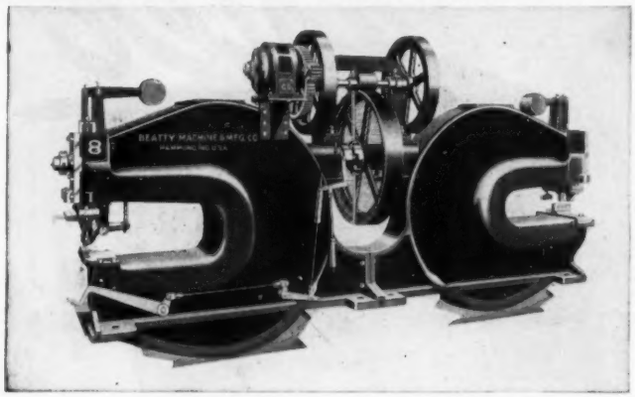
(7) Chip pan.

WRITE FOR PUBLICATION No. 482

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC LATHES

"SIAMESE TWINS" Doing *Double* Duty

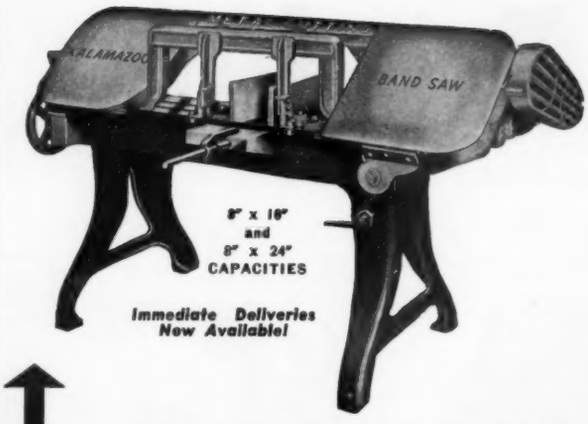


This BEATTY Double End Punch conserves floor space, reduces man power required for operation. Machines are timed to punch alternately. Machine is available with plain table or architectural type table at either or both ends . . . interchangeable tools provide punching or shearing on either or both ends. Available in a full range of throat depths. Widely used in the shipbuilding, tank, railroad, and aircraft industries. This model is one of a complete line of Detail Punches, Single End Punches and Shears, Beam Punches, Flush Front Shears, Horizontal Punches and Heavy Duty Plate Shears. If you have a heavy metal fabrication problem, call in a Beatty engineer.

BEFORE YOU BUY SEE BEATTY FIRST

Illustrating, left to right: 1. Beatty Hydraulic Brake and Flanging Machine. 2. Self-Contained Hydraulic Press. 3. Extruding Press. All are available in a complete range of sizes. Write for bulletins.

BEATTY MACHINE & MFG. COMPANY
HAMMOND, INDIANA



UP PRODUCTION WITH A KALAMAZOO

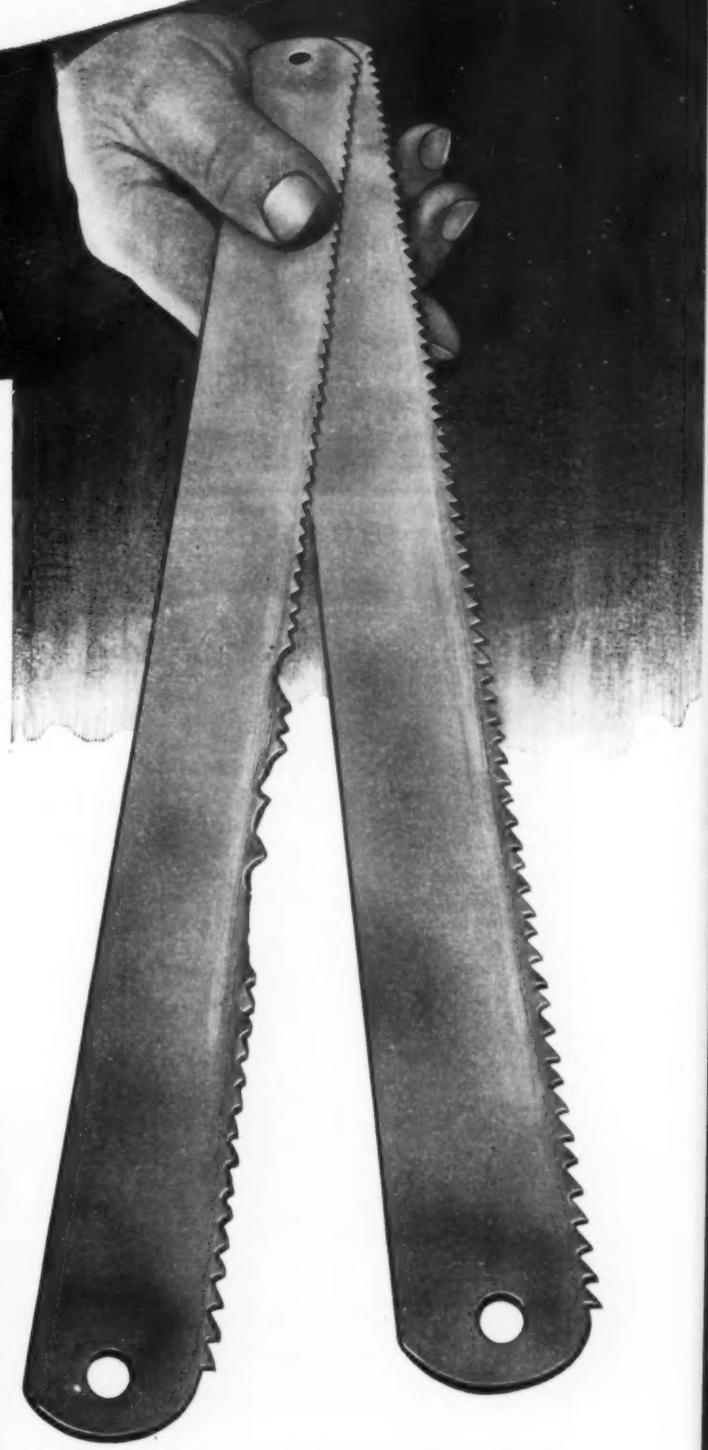
★ ★ ★ ★ ★ ★

Make your rough cuts within thousandths of an inch! Save precious machine time, save valuable steel. A Kalamazoo Metal-Cutting Band Saw gives you this kind of accuracy to boost production! Sturdy design, ball-bearing construction, hydraulic controls. Completely portable—saves set-up time. Cuts all shapes! Write for specifications.

MACHINE TOOL DIVISION
KALAMAZOO TANK & SILO CO.
505 HARRISON ST. KALAMAZOO, MICH.

Special
CUTTING TOOLS
MADE TO
CUSTOMER'S
PRINTS
aces
For your specially designed cutting tools, A.C.E. offers a highly specialized experience to insure exact reproduction and rigid inspection that minimizes rejects. Many of the nation's leading defense plants use A.C.E. special cutting tools regularly. Integrity of product is our watchword.
Send us your prints for estimate.
Note:—we do not make tools for stock.
AMERICAN CUTTER & ENGINEERING CORP.
31745 Mound Rd., Warren, Michigan
AMERICAN CUTTER
AND ENGINEERING CORP., WARREN, MICH.
SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

Which Blade is Yours?



AVOID COST OF REPLACEMENT IN *THESE* TIMES . . . . . .

WHICH BLADE IS YOURS?

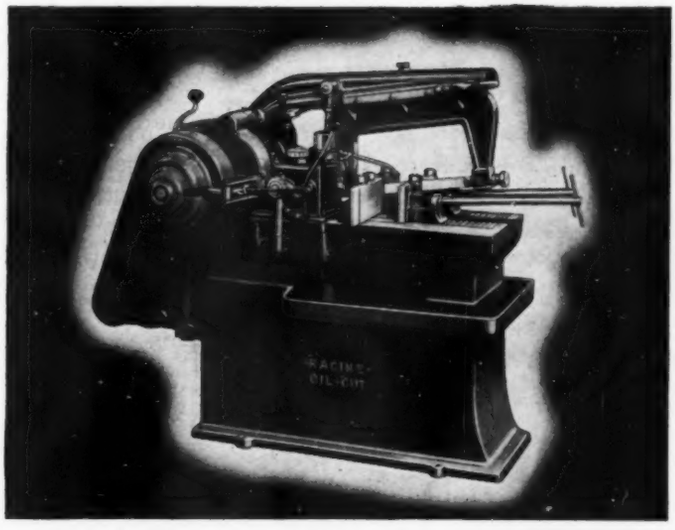
Here are two blades—one ready to deliver a maximum cut per stroke—the other ready for the scrap box.

Exclusive features on Racine High Speed Cutting Machines prevent early excessive wear on saw blades by *oil cushioned control*—eliminating costly vibration and chatter.

Each replacement—each inefficient cutting stroke is costly—and will be increasingly so as demands for war production mount.

Get the maximum out of every saw blade—use time proven Racine Metal Cutting Machines and solve your cutting problems.

RACINE TOOL AND MACHINE CO.
1751 State St., Racine, Wisconsin



Write today for illustrated folders covering our complete line.

RACINE METAL CUTTING MACHINES

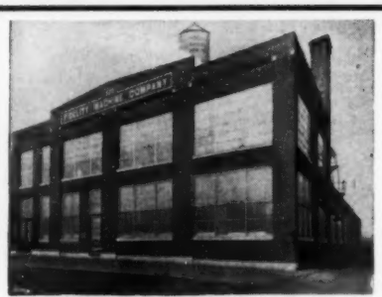
CONTRACT WORK

Advertisements on this and the following page are placed here by well-known concerns doing work on a contract basis. When you need assistance write to these established manufacturers.

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E 23rd St INDIANAPOLIS, IND.

COMMERCIAL HEAT TREATING
Seasoning of Steel, Nitriding
Centerless, Broach, Thread Grinding
Magnaflux & Optical Testing
Metallurgical & Chemical Laboratories
Cadmium & Hard Chrome Plating
AGERSTRAND CORPORATION
Muskegon, Michigan

FORGINGS
• All types up to 6,000 lbs. Smooth Forged—Finished—Rough Turned, Hollow Bored and Heat Treated to Specifications. Crank Shafts—Shafting—Connecting Rods
BAY CITY FORGE CO.
ERIE PENNSYLVANIA



Machinists and Engineers
FIDELITY MACHINE COMPANY
1908-18 Frankford Ave. Phila., Pa.
Jefferson 7600-1-2

MACHINE SHOP
Facilities include 9" South Bend Bench Lathe, #2 Brown & Sharpe Milling Machine, Drill Press and 8"x8" Shaper. The usual line of hand tools and equipment plus experienced workmenship assure your satisfaction. Your inquiries invited.
C. VANDEGRIFT CO.
HOCKESSIN DELAWARE

MACHINE SHOP WANTS DEFENSE WORK
Lathes, Milling Machines, Drill Presses, Riveting, Hot Dip Tinning, Jigs and Fixtures. Investigate TODAY.
STEPHEN J. LEWIS ENGINEERING CO.
215 Butler St. Triangle 5-5348 Brooklyn, N. Y.

Over 25 Years Experience Designing
JIGS, FIXTURES, DIES, GAUGES
SPECIAL MACHINERY
Prompt Service—Reasonable Rates
D. M. HELLER ENGINEERING COMPANY
134 N. LaSalle St. Chicago

DESIGN & BUILD
JIGS, FIXTURES & GAGES
REED MACHINE & TOOL ENG.
BOX 662
PAWTUCKET, R. I.

"More Subcontracting Will Help Win the War."

—Donald M. Nelson

In an open letter to the major prime contractors handling war contracts, the War Production Board Chairman made this statement. He went on to say, "Every available idle tool that can be put to work must be put to work. This may cost more, but the job must be done fast, and experience has taught us that some prime contracts can be subcontracted as much as 90%."

Backed by the authority of Mr. Nelson, this statement bears weight. Many companies are striving to expand their production by subcontracting but, in many cases, find it difficult to locate the capacity they want. You can capitalize on this by advertising your facilities in AMERICAN MACHINIST'S Contract Work Section. Production men have come to refer to this Section when they need outside help and your message, outlining your facilities, will help them. It gives you a chance to tell your story to the prime contractors as no other method can and stamps you as an alert, active company.

We would like to show you how reasonably you can reach these men and get your share of our war production job through advertising here. A postcard or letter will bring you the complete details. We think you will be pleasantly surprised at its low cost. No obligation, of course. In any case we would like to have a list of your available facilities to turn over to companies needing capacity of your type.

CONTRACT WORK DEPARTMENT
AMERICAN MACHINIST
330 West 42d St. New York City

CONTRACT WORK

KIRK & BLUM

CONTRACT MANUFACTURING
ACCURATE SHEET STEEL
STAINLESS STEEL, MONEL OR
OTHER ALLOY FABRICATION
OUR SPECIALTY
CAPACITY 3/8" AND LIGHTER

THE KIRK & BLUM MFG. CO.
2823 SPRING GROVE AVE. CINCINNATI, OHIO

SUB-CONTRACT FACILITIES FOR

Hand screw machine products.

Engine and bench lathe, milling and drill press work.

Small sheet metal fabrications to closer than commercial tolerances.

Stampings.

We do our own tooling.

RELIANCE MACHINE & MFG. CO.
Thirty Irving Place New York City
36 years experience in metal fabrication.

Our Grey Iron Foundry, Structural and Machine Shops are at your disposal

for

Medium Heavy

SPECIAL MACHINERY

CONTRACT WORK SOLICITED

ROBT. HOLMES & BROS., INC.
JUNCTION AVE. DANVILLE, ILL

Gray Iron and Semi Steel Castings, also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.

KING FOUNDRIES, INC.
Phone 823 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY

Put your pattern problems up to us—we will take care of them—ask the foundries about our work—they use our patterns every day.

GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

WIRE AND METAL SPECIALTIES

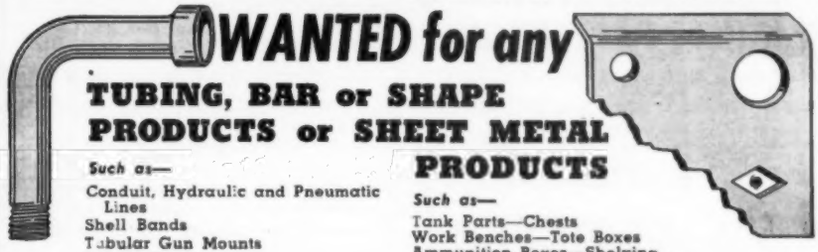
In round, flat, square and special shaped wire in all metals.

LARGE PRODUCTION CAPACITY

Plating and finishing.

EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

SUB-CONTRACT WORK



WANTED for any

TUBING, BAR or SHAPE PRODUCTS or SHEET METAL PRODUCTS

Such as—

Conduit, Hydraulic and Pneumatic Lines
Shell Bands
Tubular Gun Mounts
Primer Tubes
Retractable Landing Gears

Such as—

Tank Parts—Chests
Work Benches—Tote Boxes
Ammunition Boxes—Shelving
Machine Tool Tenders—Bench Legs
Drawer Cabinets—Ration Boxes

Machine bases, Pedestals, Frames and Lathe Pans formed and arc welded.
Sheet metal fabrication. All kinds of press work. Stampings, Cover plates, Louvre panels.
Light and heavy fabrication and assembly.
Forming, bending, cutting off and machining of bars, tubes and shapes. No item or quantity too large or too small.

Graduate Engineers on Our Staff for Design Work

AURORA EQUIPMENT CO. AURORA, ILLINOIS
Phone - AURORA 9232

CONTRACT WORK—

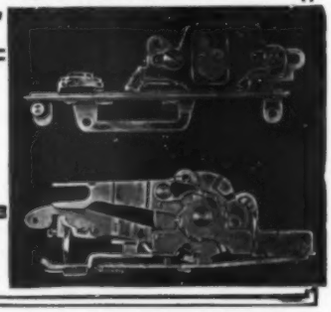
We can build machines and parts, special tools and fixtures of all kinds to your specifications and design. Skilled workmen and modern equipment are your guarantee of satisfaction. The design and building of wire and ribbon stock forming machines are our specialty.

We solicit your blueprints or samples for quotation. No obligation of course.

THE A. H. NILSON MACHINE COMPANY
Bridgeport, Conn.

STAMPINGS AND ASSEMBLIES

"GREATER SAVINGS WITH GREIST"



We can make short or long runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. We are also fully equipped to make

SCREW MACHINE PRODUCTS
TOOLS, DIES, JIGS, FIXTURES

Quality work by skilled mechanics is assured. Send your blueprints or samples today!

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

THE NORLIPP COMPANY

Engineers . . . Manufacturers

Sub-contract facilities for die castings and metal stampings
556 West Congress Street Chicago, Illinois

GAGES—PUNCHES—DIES—ETC.
HEAT TREATING FACILITIES

BARTON MACHINE & TOOL CO.
PRECISION TOOL MAKERS

14 Taft Street Pawtucket, R. I.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word, minimum charge $2.00. (See ¶ on Box Numbers.)
POSITIONS WANTED (full or part-time salaried employment only), ½ above rates.
PROPOSALS. 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns — 30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M., December 14th will appear in the issue of December 24th subject to limitations of space available

WANTED

TOOL ENGINEER

Experienced in design of jigs and fixtures for milling, drilling and turret lathe work. Prefer man with actual practical experience. Old established company with excellent post war prospects.

P-354, American Machinist
520 No. Michigan Ave., Chicago, Ill.

OPPORTUNITY NOW AND AFTER WAR

ENGINEER EXPERIENCED IN MACHINE TOOL DESIGN and with special production layouts. Capable of originating designs; also of field engineering with sales force. Practical experience operating machine tools desirable. For established company with headquarters in Chicago for position handling war machinery problems and qualified for opportunity developing new and special products after war. Compensation in accordance with capability and opportunity for advancement. Replies must be complete and will be kept confidential.

P-347, American Machinist
520 N. Michigan Ave., Chicago, Ill.

WANTED

METHODS ENGINEER

Man experienced in estimating and processing general machine shop line of parts that can be handled on turret and engine lathes, all type milling and drilling equipment. Excellent post war prospects with old established company for capable man.

P-353, American Machinist
520 No. Michigan Ave., Chicago, Ill.

WANTED

HYDRAULIC ENGINEER

with both Aircraft and Commercial experience for Development work. Old established company with excellent post war prospects.

P-355, American Machinist
520 No. Michigan Ave., Chicago, Ill.

WANTED

PRODUCTION MANAGER

For eastern gear manufacturing plant. Must have gear experience and ability to supervise production methods. Write full details of past experience, names and addresses of former employers, age, salary and draft status.

P-356, American Machinist
330 West 42nd St., New York City

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

WANTED—DESIGNER for small cutting tools and for jigs and fixtures. Permanent position. McQuay-Norris Manufacturing Co., Connersville, Indiana.

MACHINE SHOP SUPERINTENDENT With wide and varied experience in job shop work on Engine Lathes, Boring Mills, Planers, Shapers, and Milling Machines. Must have thorough working knowledge of Tools, dies and gears, and be capable of supervising 100 men. Permanent position with reliable company doing war work. State salary desired, past experience, draft status, and enclose photo of self in first reply. All replies held strictly confidential. P-362, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

MACHINE DESIGNER and Draftsman. Complete knowledge of designing heavy and light machinery and equipment, preferably experienced on meat packing design. Permanent position with reliable company. State salary desired, with past experience and draft status, in first reply. All replies held strictly confidential. P-363, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

WANTED

Tool room foreman who can earn $6500.00 per year to take charge of tool room in a western Michigan concern. The man we will hire for this job must be able to get work out as scheduled in accordance with prints and specifications and at a minimum cost.

The man we are looking for must have the responsibilities of foremanship.

If you are looking for a job on salary to retire do not apply.

P-366, American Machinist
520 No. Michigan Ave., Chicago, Ill.

WANTED

PRODUCTION CONTROL SUPERVISOR

Modern Plant, New York Metropolitan Area, established over 50 years, now doing war work, manufacturing precision metal fabrications, machined assemblies and electrical products. General factory administrative experience essential. Those employed at their highest skills in war work not considered. Salary open!

P-357, American Machinist
330 West 42nd St., New York City

POSITIONS VACANT

SUPERINTENDENT—We require the services of a competent superintendent to operate a plant employing 300 people; must have production experience combined with a mechanical knowledge required in a plant doing stamping, spot welding, arc welding, assembly of metal parts; firm has been established in Chicago over 50 years. Plant making war and essential civilian items. This is a permanent position. P-364, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS — $3,500 to $25,000. This advertising service of 32 years recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500 or more send for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

Manufacturing Executives and Technical Men, chemists and metallurgists immediate openings throughout country. Salaries $2500 to $20,000 year. Write for application. Confidential. Established 27 years. Harrison Personnel Service, 20 W. Jackson, Chicago.

EMPLOYMENT AGENCY

ENGINEERS—Fine selection of positions open for Manufacturing executives, Production Managers, Superintendents, Foremen, Metallurgists, Chemists, Instrument men, Technical men of all types. The Engineering Agency, Inc., Our 50th year, 53 W. Jackson Blvd., Chicago.

POSITIONS WANTED

FACTORY MANAGER, 45, M.E. with broad experience in manufacturing, tool and process engineering, production control, progressive plant layout for manufacturing and assembly, time study, special and automatic machine design, with successful record in handling prime and subcontracts for precision parts, welcomes the opportunity to change over plant to war production or if already converted to increase output through improvements in methods and organization. For after the war I have to offer extensive experience in developing engineering. PW-361, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

SITUATION WANTED by mechanical draftsman. Fair knowledge of tool, machine, and die design. Fifteen years' experience. Prefer smaller concern not directly engaged in war work. No detailer's job wanted. Please address replies Post Office Box 69, Weatogue, Connecticut.

(Continued on the opposite page)

Professional Services

COLUMBIA ENGINEERING CORP.
STRUCTURAL, MECHANICAL & ELECTRICAL ENGINEERS
War Plant Design - Supervision of Construction - Engineering Reports
61 Broadway, New York, N. Y. — 323 Plum Street, Cincinnati, Ohio

POSITIONS WANTED
(Continued from preceding page)

MANUFACTURERS AGENT with 20 years of contacts in New England and New York State, and having established organization, looking for additional line. PW-365, American Machinist, 330 W. 42nd St., New York, N. Y.

SELLING OPPORTUNITIES
OFFERED—WANTED
Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITIES OFFERED

SALESMAN to sell new improved machine tools on commission basis, also jobbers. Tietzmann Engineering Co., 1043 Highland Ave., Dayton, Ohio.

SALESMEN WANTED throughout country calling on tool-room and grinder foremen to carry a side line of greatly improved diamond point wheel dressers and diamond tools. Please write SW-343, American Machinist, 330 W. 42nd St., New York, N. Y.

PATENT ATTORNEYS

PATENTS—Booklet free. Highest references. Best results. Watson E. Coleman, Patent Lawyer, 724 Ninth Street, Washington, D. C.

PATENTS, COPYRIGHTS. Booklet. "General Information Concerning Inventions and Patents" and "Fee Schedule" send without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

CONTRACT WORK

WORK WANTED — For advertisements of work wanted see names indexed under Contract Work in the Searchlight Section Index appearing on page Facing inside back cover.

Capital Available for Refinancing or for Reorganizations of large Industrial Concerns or for outright Purchase of large going Concerns.

No Promotions

ASSOCIATED STEEL CORPORATION
527 5TH AVENUE, N. Y. C.

We Desire Work for Vertical Boring Mills

Diameter from 42" up to 60". Quantity—long run.

Send us your inquiries.

WW-359, American Machinist
330 W. 42nd St., New York City

WANTED

NEW INVENTIONS WANTED

Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

WANTED
SALES MANAGER
by

Machine Tool Builder with well-known, medium size organization, designing and building special and standard machinery, firmly established for many years, location Detroit. Excellent opportunity for a permanent position.

SW-367, American Machinist
520 No. Michigan Ave., Chicago, Ill.

SALESMAN WANTED

There is an opening in a few selected territories for an experienced salesman who has successfully sold services or intangibles. Technical experience not necessary. An American Citizen, between the ages 35 and 55, preferably married, who is able to meet and contact key executives in industry. Field training will be given the successful applicant and earnings should be $4,000 a year—the average of our present salesmen. One acquainted with the field served by this publication will find this connection a pleasant and profitable one. Our organization is an old, well-known concern with an excellent reputation. To learn more about this opportunity write full details to Box

SW-368, American Machinist
330 W. 42nd St., New York City

WELDING—MACHINIST EQUIPMENT SALE

Baltimore Institution, because of owner's Military Service, is offering for sale over 90 pieces of Welding & Machinist Equipment and Complete Office Fixtures. Equipment includes small lathes, milling machine, drill press, up to 300 ampere welding machines (2 phase & 3 phase), drafting tables, 50 desk chairs, Radiagraph, electric wiring systems, portable air conditioning units, typewriters, registers, 6 desks, office partitions, exhaust fans, fire extinguishers, acetylene gauges and torches, etc.

Maryland Technical Institute
St. Paul & Franklin Sts. Baltimore, Md.

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DeWITT TOOL COMPANY
173 Grand St. New York City

1—Patch 48" x 48" x 14'—4 Head Planer; Arranged for motor drive with D.C. motor and control with A.C. to D.C. convertor.
1—Dietrich & Harvey 24" x 24" x 10' Open Side Planer; one head, arranged for motor drive with A. C. motor.
1—Fifield 72" x 23' Geared Head Lathe; Geared face plate drive, arranged for motor drive with 35 H.P. D.C. meter with variable speed apron control and also additional 23' bed for above.
1—Chambersburg 1800 lb. Double Frame Steam Hammer.
1—No. 50 Producto-matic, motor driven Milling Machine.

ACME EQUIPMENT CO.
128 South Clinton St. Chicago, Ill.
Telephone ANDover 3430

FOR SALE

Landis and J. & L. High Speed Die Head Chasers
300 sets
Write for list.
CARL A. YARD
Sea Girt, N. J.

RIFLING MACHINE

One (1) 38-ft. long LE BLOND Screw type Rifling Machine complete with two-gun tube rests, index head and rifling bar head. Driven by 15 H.P., 230 volt, D.C. motor complete with dynamic brake and acceleration controls, three cylinders, 2¾" x 4" National Transit pump, "V" belt driven by 10 H. P. 220/440 volt, A.C. motor.
THE YODER COMPANY
5500 Walworth Ave. Cleveland, Ohio
Telephone: MElrose 0520

FOR SALE—IMMEDIATE DELIVERY

1—48" Ryerson High Speed Friction Saw with one new and one used but serviceable blade, machine complete with electric motors and controls. Condition A-1.
THE LANG COMPANY
267 West First South Salt Lake City, Utah

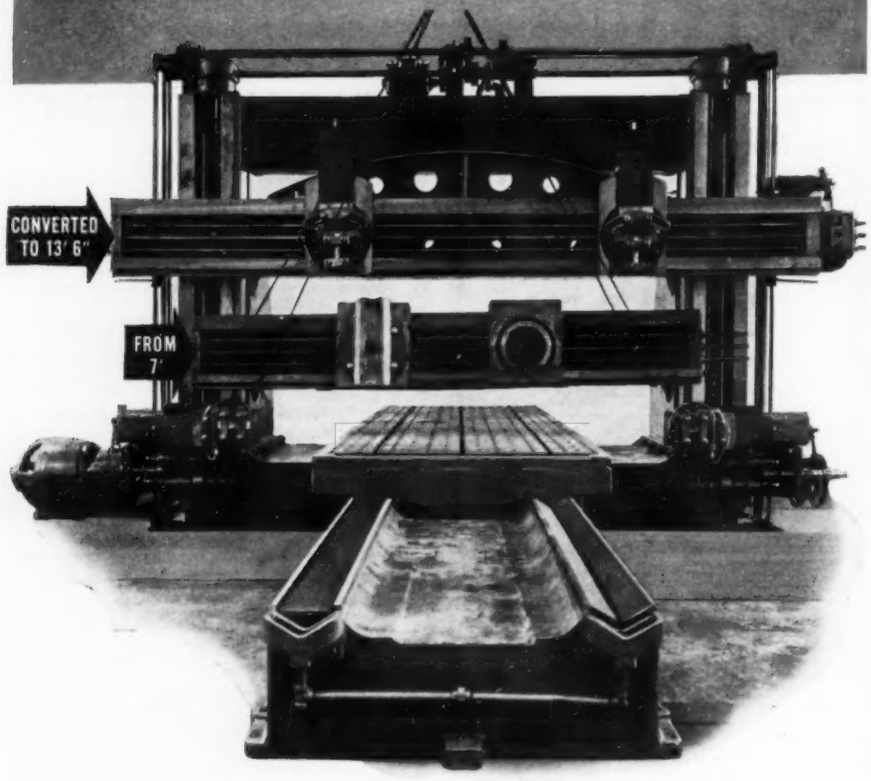
2A Warner & Swasey, Serial 80,000
Cleveland Universal Milling Machine, 13 x 50 table, single pulley drive
42 x 42 x 10' Niles Planer
28 x 16' Ames LCG Lathe, solid spindle, compound rest
36" Becker Gear Cutter
#7 Becker Lincoln Type Miller
JOHNSON MACHINERY COMPANY
271 Halsey Street Newark, N. J.

FOR SALE
VICKERS HYDRAULIC EQUIPMENT (NEW)
2 each #206B Flow control panels, #V 104 A Pumps, #M2B 15FL Fluid Motors, #C430C four-way valves.
561 lbs. 1 9/16" x 22 ga. Dead soft deep drawing brass in coils.
J. E. HAWLEY
Phoenix, Ariz.

GRINDERS

Landis, 12x36", 16"x52", self-Cont. M.D.
Modern 10x24", 14x42", M.D.
Norton 18x50"
Pratt & Whitney 14", B.B., M.D.
Norton 50"x28' Roll, M.D.
AARON MACHINERY CO.
45 CROSBY STREET NEW YORK N. Y.

THIS IS CONVERSION



American Industry has worked its Miracle. In one word...Conversion. What is it and how did it happen?

Conversion is the adaptation of industrial facilities to wartime production. Conversion is the tremendous job of sorting and reassigning machine tools, of rebuilding many of them for the new and more exacting operations. But to Simmons conversion is not a new word. Simmons engineers have been remaking old machine tools for thirty years. Time and again new jobs call for equipment which is not on hand.

Such was the problem of the Vulcan Iron Works. Its war contract called for a planer 13′ 6″ between housings to produce the main engines of heavy cargo vessels. None was available. How, then, to convert an available planer, 7′ between housings, to the desired width?...Illustrated above is the answer. Simmons took this planer and, by providing a new rail and bridge, together with widening blocks between the housings and the bed, converted it to 13′ 6″. This photograph shows the comparison between the new rail and the old one directly beneath it.

Writes E. Perry Holder, Vulcan president: "To obtain such a planer *new* would probably take nearly a year. This time was shortened 75% by your Rebuilding Program, thus enabling us to speed up our deliveries and help the transportation problem in general."

IN STOCK

Every machine listed in this column is in our warehouse at press time.

●

60" NEWTON PORTABLE SLOTTER, M.D. with D.C., 230 volt MOTOR and STARTER, 36" cross feed, 6" in and out adjustment and angular feed.

No. 9 N.B.P. VERTICAL MILLER, 39" dia., Rotary Table, 4" dia. Spindle. Traverse, Longitudinal and Cross, 24", Vertical, 16", M.D.

30" BAKER Draw Stroke KEYSEATER. Circular table 38" dia., overhang 35".

30" x 30" x 10' NEWTON SLAB MILLER, Horizontal arbor, table working surface 27" x 10', M.D.

14" PUTNAM CRANK SLOTTER. Rotary table 33" dia., 26" overhang.

400-Ton NILES WHEEL PRESS, Double Type, 48" between bars, equipped with pump and motor.

60" THROAT LONG-ALSTATTER SINGLE END SHEAR, with 20" shear blades, approximate weight 42,000#.

72" LONG-ALSTATTER MULTIPLE PUNCH, 6" throat, 1½" stroke, M.D.

6" x 6" x ⅝" SOUTHWARK DOUBLE ANGLE SHEAR, square or bevel, right or left hand, M.D.

●

Awarded to Simmons Machine Tool Corp., Aug. 20, 1942, for excellence in production.

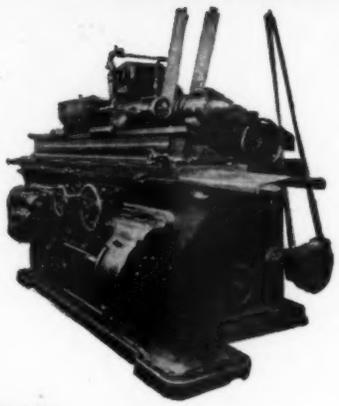
Send for your free copy of *"The Simmons Way of Engineered Machine Tool Rebuilding."*

SIMMONS ENGINEERED Machine Tool REBUILDING

SIMMONS MACHINE TOOL CORP.
1759 NORTH BROADWAY, ALBANY, N. Y.
NEW YORK OFFICE: 149 BROADWAY

When You Need Machine Tools Check "FALK'S" Stock

"FALK" for DEPENDABILITY in Rebuilt Machinery



GRINDERS

Gorton, double end disc grinder, 18" discs
#51 Oliver drill grinder, M. D.
Sellers drill grinder
#1 Le Blond tool and cutter grinder

COMPRESSORS

Gardner, 4½ x 4½, duplex
Bury, 8 x 8
Curtis, Verticle, duplex, 8 x 8

BRAKES

Dreiss & Crump 8' x 14 gauge
Dreiss & Crump hand brake, 8' x 18 gauge

GEAR CUTTER

Gould & Eberhard, 36" arranged motor drive

RADIAL DRILLS

2—Niles, Bement-Pond, flat column 5' arm
Niles Bement Pond, flat column 6' arm

RIVETING MACHINES

#3A Grant riveting hammer, 5/16" capacity

DROP HAMMERS

2—Standard Automatic, 100 lbs.
Standard Automatic Belt drop hammer, 200 lbs.

TURRET LATHES

#4 Warner & Swasey, 1½" capacity.
#6 Warner & Swasey, 2¼" capacity
21" x 3¾" Hole—Gisholt Universal

SAWS

Hunter friction Saw, motor driven, 16" blade
Peerless, saw size 10x10
Racine Saw size 9x9

THREAD ROLLERS

2—#10 Waterbury & Farrell thread rollers
2—#0 Waterbury & Farrell thread rollers
2—#30 Waterbury & Farrell thread rollers
2—#22 Waterbury & Farrell cold headless & double Stroke solid die
#33 Waterbury & Farrell cold headers & double stroke solid die

TRIMMERS

2—Waterbury—Farrell Automatic Trimmers 5/8 cap.

MILLERS

#1 Le Blond Universal Miller
Sanford production Miller
#7 Becker production Miller
Pratt & Whitney Duplex miller
Hall planetory thread miller
Lees Bradner thread miller, 54"
Taylor & Fenn Verticle milling #7 B&S taper
2—Type A Gooley & Edland production millers, m.d
Cincinnati #3 high power, cone drive, flange nose

PRESSES

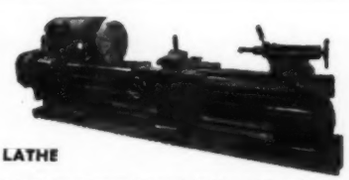
#3 Niagara 1½" stroke
#3 Baxendale, 2" stroke
#2 Baxendale 1½" stroke
#16 Niagara horn press, geared, M.D.
#44 V. & O. horn press geared, M. D.
#62 Bliss reducing press, Henry & Wright press, 25 ton, General Flxible press, 3 ton
#65½ Consolidated punch press, straight side

SHEARS

Pexto foot shears, size 36" x 16 gauge
156" Hyde Park, ⅜ cap. 18" gap, M.D.
156 "Mesta ½" cap., 15" gap motor drive

THREADERS

14—Chicago automobile Venticle threader 2 spindle



LATHE

McCabe Geared head lathe 40" swing 18' bed 18 speeds, direct motor drive 3/60/220
18 x 10' Rahn Larmon plain change geared lathe
10" x 24" New Logan lathes, with collets, etc.

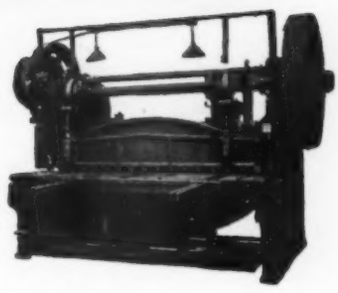


PLATE SHEARS

156" Mesta Eng. Co. ½ cap. 15 gap, M.D.
#262 Niagara, 60", 14 gauge, arranged motor drive

PRESSES

No. 4 Bliss, double Crank, geared forging press.
2—No. 4½ Bliss double crank geared forging press
2—No. 4½ S Bliss, three column, geared forging press with Taper rolls
No. 5—Bliss, double crank, geared forging press press
48" Wickes Bros. double end punch and shear 1¼ thru 1¼ cap. motor drive

TAPPERS

#2 Garvin Tapper

UPSETTERS

Acme upsetter 1" cap.
Acme upsetter 1⅛" cap.

BORING MILLS

62" American, heavy duty, verticle boring mill 2 swivel heads, self contained belt drive Friction feed
Friction feed
#1 Barrett Horizontal boring and facing mill 3⅞" bar, with facing head.

DRILLS

3—Barnes drill 20" cap. #3 Morse Taper
3—Buffalo Forge drill 20" cap. #3 Morse Taper
Avey drill, two spindle #2 Morse taper
Avey drill three spindle size ½
Cincinnati 24" upright heavy duty

MISCELLANEOUS

Abbott burnishing barrel 8" x 36"
Degreaser size 48" x 21" x 20"
Torrington Slitter, for tin plate, 3 sets of cutters
Blakeslee metal washer

We try to maintain one of the leading stocks of Used Machinery.

SEND US YOUR INQUIRIES—EVERY ITEM FULLY GUARANTEED.

FALK MACHINERY COMPANY

MACHINERY MERCHANTS

18 WARD ST., ROCHESTER, N.Y.

MOVING PICTURE of a BATTLE on the Working Front

EVERY BATTLE is the sum of a thousand little battles, every victory the total of many little victories. Not all of them are won on the front lines. Our particular job is on the working front. Our objective is to increase the production of war materials. Our "weapons" for you are equipment of all kinds, which we locate, bring to our shops and completely rebuild. This is a job we understand. A job we're well fitted by 27 years of experience to do. And a job that has a place in the grand strategy of war. For grand strategy is economic as well as military, and used machine tools, electrical and power plant equipment—located, reconditioned and redistributed by dealers like ourselves—saves time and labor and material.

We are also representatives in the Philadelphia area for many of the leading national manufacturers of new machinery

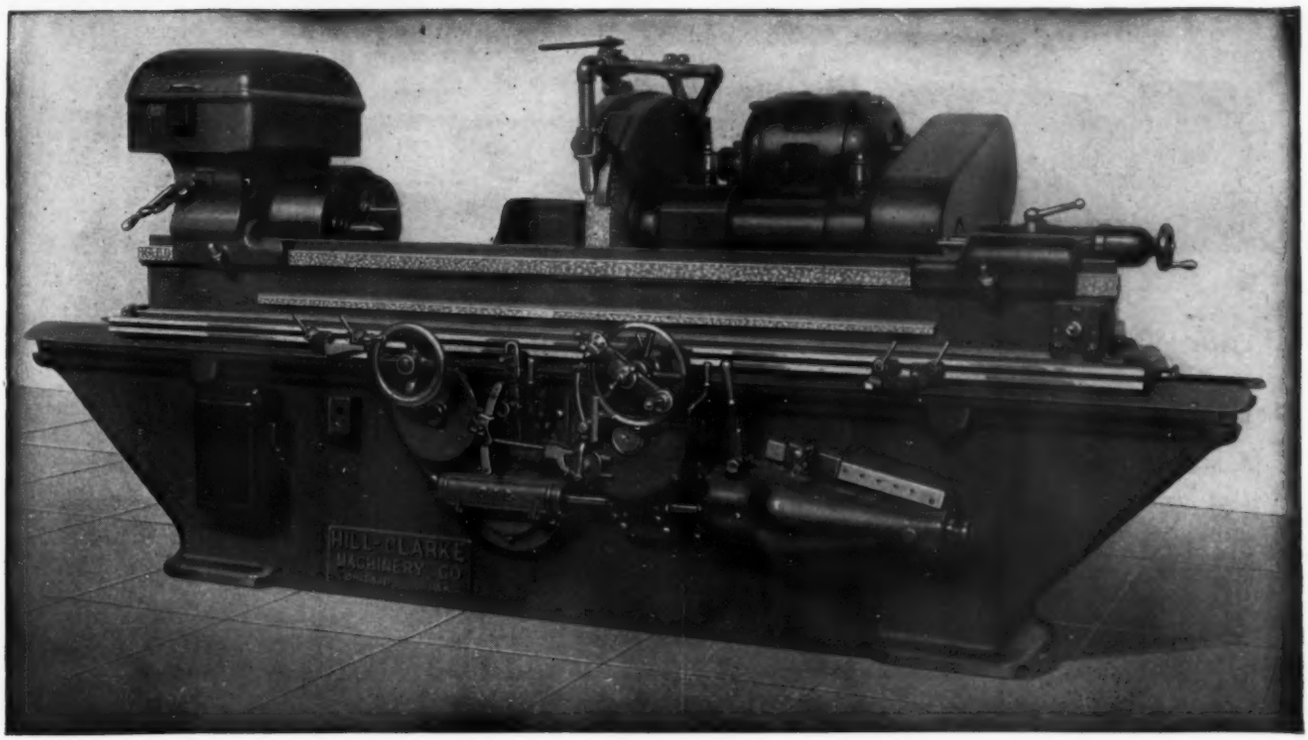
THE O'BRIEN MACHINERY CO.

PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS

113 NORTH THIRD STREET • PHILADELPHIA - PENNA.

BELL TELEPHONE: MARKET 4180 CABLE ADDRESS OBRIEN-PHILA

Yours for Super Grinding!



HILL-CLARKE MODERNIZED CYLINDRICAL GRINDERS

give you a finish within a few micro-inches even when using standard grain free-cutting wheels. Contributing to this achievement is a patented multiple V-belt drive from a constant speed motor to the work spindle.

Throughout the machines there are refinements in design, fitting of components, minimized vibration which make possible extreme accuracy in all grinding operations. An accurately fitted wheel slide with cross feed screw mounted in ball bearings provides sensitive wheel control essential to duplicate work within close limits. For complete information, write for our illustrated catalog "Super Grinding."

SIZES

10 x 36	14 x 36	16 x 50
10 x 50	14 x 50	16 x 72

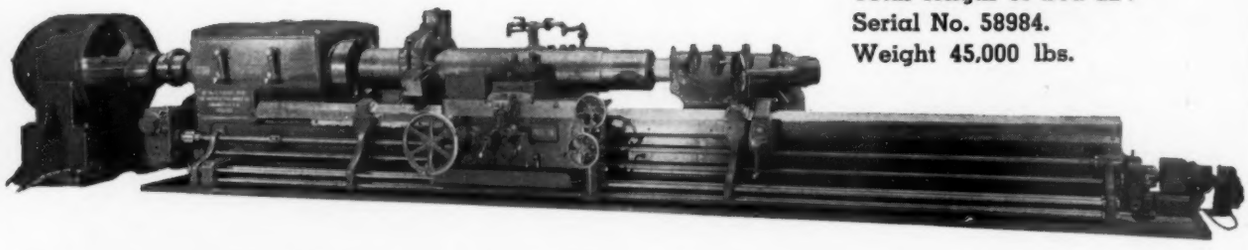
Have You Any NORTON Grinders You Wish Modernized & Motorized?

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BOULEVARD, CHICAGO

22" AMERICAN 100 H. P. INPUT SUPER LATHE

Swing over shears 22½".
Distance between centers 16'.
Total length of bed 22'.
Serial No. 58984.
Weight 45,000 lbs.



Electrical equipment—100 H.P. main drive motor and 4 other motors. All motors 230 volt, direct current.

140 spindle speeds from 33 to 1200 RPM.

A super-powered, super-capacitied lathe, designed to obtain the maximum metal cutting capacities of cemented carbide cutting tools. Equipped with anti-friction bearings throughout, hardened and lapped helical gears in headstock, apron control, chip breaker, chip conveyor and many special features. Designed for extra heavy work, especially the turning of forgings.

THE EASTERN MACHINERY CO.

1004 TENNESSEE AVE. **CINCINNATI, OHIO**

LATHES
48"x18' Fifield Triple Geared Face Plate Drive; raising blocks to swing 66"; B. D.
VERTICAL BORING MILL
10-ft. Niles; 2 heads; M.D.
FROG AND SWITCH PLANER
36"x16"x20' Putnam; M.D.
DRILL PRESSES
3-ft. American Sensitive Radial; M.D.
Single Spindle Colburn Heavy Duty Drill.
GEAR CUTTER
60"x12" Gould & Eberhardt; M.D.
MILLERS
No. 3 Davis Thomp. Rot. M.D.
PIPE MACHINES
10" Saunders.—2" Jarecki.

SUN MACHINERY COMPANY
36 Van Vechten St. Newark, N. J.

REYNOLDS MACHINE TOOL REBUILDING . . .
Helps Speed War Production

The Reynolds plant is one of the most modern and best equipped plants in Rhode Island for rebuilding machine tools.

Complete engineering and manufacturing facilities are available for modernizing, motorizing and placing existing machine tools in condition for maximum production demands and highest accuracy.

REYNOLDS MACH'Y CO.
211 Eddy St.
PROVIDENCE, R. I.
Phone: Gaspee 5187

1—No. 2 P & W Shaving Machine
1—No. 6 Fellows Gear Shaper
1—Watson-Stillman 4-plunger Horizontal Hydraulic Pump, motor driven

D. E. DONY MACHINERY CO.
New and Used Machine Tools
47 Laurelton Road Rochester, N. Y.

AUTO. SCREW MACHINES
2¼" Gridly 4 spindle
2¼" Nat.-Acme 4 spindle
3¼" x 4¼" Gridley, sgl. spindle

CANAL MACHINERY COMPANY
176 LAFAYETTE STREET, NEW YORK, N.Y.

FOR SALE
SCREW MACHINES
Three—2" Cleveland, Model A, Single Spindle Automatic Screw Machines. Can be inspected in Factory near Springfield, Mass.

Write to:
FS-360, American Machinist
330 West 42nd St., New York City

The EMERMAN RED BOOK
Machinery Tools and Supplies
No. 35
LOUIS E. EMERMAN AND COMPANY
1761 ELSTON AVE. CHICAGO
HEADQUARTERS FOR ALL TYPES OF USED METAL WORKING MACHINERY— STAMPING PRESSES—STRUCTURAL TOOLS
LOUIS E. EMERMAN AND COMPANY
1761 ELSTON AVE. CHICAGO TEL. BRUNSWICK 4130
— Also FORGING EQUIPMENT— HYDRAULIC EQUIPMENT
— Our Stock is Large and Varied
— Our Prices Represent Real Values
SEND US YOUR INQUIRIES

AUTOMATICS

14"x19" Fay
No. 6A Potter & Johnston
Nos. 33, 34 and 454 New Britain
4½" Gridley model H
6"x8¾" Goss & DeLeeuw
1" Cleveland "J" double end
No. 16 Gisholt simplimatics
10" Bullard "Vert-au-Matic"

BROACHES

Nos. 1, 3 and 4 LaPoint screw
No. 3 LaPoint double screw
No. 2 Standard screw press
2 ton American rack vertical

DRILLS

15", 20", 21" Buffalo
20", 23½" and 26" Barnes
21" and 25" Superior
20", No. 210 Barnes heavy
24" Barnes all geared
20" No. 23 Foote Burt
21" Cincinnati manufacturing
Natco multiple Nos. 11, 12, B12, C12, 14 and 32, 8 to 62 spindles
No. 1 Baush multiple
No. 13 Pratt & Whitney multiple
Nos. 15½D and 15½F Foote Burt manufacturing
No. 8H Natco hydraulic horizontal multiple
Barnes vert. mult. hydr.
8 spindle No. 6 Moline Holehog
Nos. 0 and 00 Garvin duplex
4"x10" Sundstrand centerer
4' Hammond radial
Sensitive drills. Almost all makes and sizes

FORGING & STRUCTURAL

1½" Acme upsetters
2½" and 4" Ajax upsetters
2" National upsetter
No. 1A Ajax forging rolls
No. 4 Torrington swager
No. 6HS Langelier swager
60 lb. Bradley helve hammer
150 lb. Nazel air hammer
No. 1 Rock River bulldozer
No. 29 Williams White bulldozer
12", 1½"x1" Cleveland horizontal punch
12", 1¼"x1" Long & Alstatter punch
26", ¾"x¾" Rock River punch

GEAR MACHINERY

Nos. 3 & 12 Barber Colman
No. 18 H Gould & Eberhardt
Nos. 1 & 5A Lees Bradner
26"x48" Brown & Sharpe automatic
20" Flather automatic
36" Gould & Eberhardt automatic
60" Cincinnati automatic
Nos. 6, 61 & 62 Fellows shapers
18" Gleason testers & lappers
15" Gleason spiral gear rougers
Gleason spiral pinion rougher
18" Gleason bevel generator
2 spindle Lipe chamferer
Pratt & Whitney worm grinder
National gear checker

GRINDERS

10x36 x 10x50 Norton
12x36 Landis
12x36 Cincinnati
Capitol internal
Nos. 6 & 15A Bryant internal
12"x36" Diamond surface
20"x50" Safety surface
Nos. 50 & 60 Heald cylinder
18", 24" & 58" Gardner disc
24", No. 84 Gardner opposed disc
17"x36"-48" Norton hydraulic crankshaft
Gisholt tool grinder
24" Ingersoll tub type
30" Ransom elect. snagging
16" Norton snagging
2¼" Wil. & Morman drill
Type 15 Norton lapper
No. 575 Hawes tub polisher
20" & 36 Wet Tool

LATHES, TURRET

28" Steinle, 8" hole
24" Steinle 6¼" hole
22" Steinle, 3-9/16" hole
22" Libby, 4½" hole
2¼x24 & 3"x36" Jones & Lamson
Double spindle Jones & Lamson
14"x8' Lodge & Shipley with turret
No. 2 Acme
No. 2 Southworth
No. 2 Warner & Swasey

LATHES, MFG.

11"x3' South Bend, OCG
13"x20" Seneca Falls "Short Cut"
13"x6' Automatic threading
20"x5'6" Wickes mfg.
Melling camshaft
Melling crankshaft
28"x9' centers Bridgeford axle
3½"36" Lo Swing

MILLS, BORING

3⅞" bar Beeman & Smith horiz.
4-15/16" bar Barrett cylinder boring
36" Niles vert. car wheel borer

MILLING MACHINES

No. 3 Turnmilling for round work
Nos. 1 & 1A Davis & Thompson drum type duplex
48" Oesterlein tilted offset
Nos. 10 & 45 Productomatic
No. 6 Whitney hand
12" Pratt & Whitney automatic
Model AB Becker vertical

PLANERS & SHAPERS

24"x24"x5' Gray
24"x24"x6' Woodward & Powell
29"x29"x6' New Haven
36" Morton draw cut shaper
12" Dill vert. shaper or slotter

PRESSES

No. 5 Bliss Consolidated OBI
No. 5½ Niagara OBI
Nos. F2 & PA3 Ferracute
Nos. 14½ & 41A Toledo horning
Nos. 6 & 6½ Wat. Ferrel gap
No. 76 Toledo gap frame
No. 62 Bliss gap frame
No. 38½ Bliss straight side
No. 53 Toledo straight side
No. 8-7 Zeh & Hahnemann S.S.
No. 7 Rockford straight side
No. 4 Massillion straight side
No. 2 Standard screw type
28", No. 71 Swaine dbl. cr.
No. 6A Bliss cam drawing
No. 180 Toledo toggle drawing
No. 796¼ Toledo double crank toggle drawing, 108" bet. upr.
750 ton Baldwin Southwark triple action hydraulic toggle, 142½" between uprights

RIVETERS

Nos. 3A, 4A, 5½B & 7B High Speed
No. 80 Grant
20 ton Allen pneumatic

SHEET METAL TOOLS

4'x3/16" Cincinnati press brake
12'x10 ga. Ohl press brake
4'x3/16" Bay City band roll
No. 352 Toledo band roll
Nos. 1 & 2M Pettingell hammers
⅝"x3' and 5' Shuster wire straightener & cutter
Sleeper & Hartley casing coiler
No. 5 Sleeper & Hartley spring coiler
No. 3 RH Magee Wirer

SHEARS

No. O-15 Stanley Uni-Shear
No. 225 A Bliss slitter
18" Pels beam
2" Newbold guillotine
1½" Lewis alligator
2" Hilles & Jones alligtaor

TAPPERS

⅝" National precision nut
Nos. 1 & 2X Garvin
Natco lead screw, 1 & 2 way
1½" National 6 spindle nut

THREADERS

⅛"x3" Wat. Farrel thread roller
¼" Acme double head
¾" Economy
1½" Geometric
2" Landis double
2" Landis pipe & Nipple
2" Rogaco pipe mach.

MILES MACHINERY COMPANY, Saginaw, Mich.

AVAILABLE NOW

No. 14 Pratt & Whitney Vertical Surface Grinder, motor-driven with motor for spindle and motor for feeds. Magnetic chuck. Nice condition.

12x52" Landis Plain Cylindrical Grinder; self-contained.

Nos. 2 and 3 Brown & Sharpe Universal Grinders.

2" Mitts & Merrill Keyseater, motor-driven.

No. 12 Brown & Sharpe Production Mills.

A. R. MARSH MACHINERY CO.
4900 W. 73rd St. Cleveland, Ohio

MISCELLANEOUS MACHINES

Rockford Sgl. End Hydr. Boring Machine with 2-sta. 54" dia. table.
6' Niles Pl. Radial Drill
No. 60 NATCO 3-Way Multiple Drill
4-Spdl. Henry & Wright H.S. Drill
Niagara Dbl. Seamer, t.&l. pulley dr.
10x10" Napier Metal Band Saw
½" Shuster Auto. Cut.&Straight. Machine

STRONG, CARLISLE & HAMMOND COMPANY
1392 West 3d St., Cleveland, Ohio — **2832 E. Grand Blvd., Detroit, Mich.**

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

LATHES

18" x 6' American Grd. Hd. 8 speed M.D. Turret on shear Q.C.
18" x 8' L & S Patent Head Lathe, M.D. Q.C.
24" x 18' New Haven, Semi Q.C. Cone drive.
36" x 16' Lodge & Shipley Sel. Grd. Hd. T.A.
40" x 20' McCabe Lathe, Cone Drive, Trip. Grd.
56" x 18' Putnam Turning Lathe, Belt feed.

GRINDERS

16" x 72" Landis Plain Grinder, Self contained.
Fitchburg Spline Shaft Grinder.
#55 Heald Cylinder.

MILLERS

#1 P & W Hand Miller.
18" x 18" x 9' Beaman Slab Miller.

MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#00 Pfauter Gear Hobber.
#1 Adams Gear Hobber.
#1 Schucahrdt & Schutte Gear Hobbers.
Lees Bradner Gear Grinder.

MILLS

62" Colburn Vertical Boring Mill.

PLANERS

32" x 32" x 18' Gray Planer, 2 Heads.

SLOTTER

14" Niles Bement Pond Slotter, Cone drive.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St. Cincinnati, Ohio

BROACH, No. 2 LaPointe, M.D.
GEAR CUTTERS, Spur, 30", 36" & 40" M.D.
GEAR PLANERS, Bevel, 36" & 54" Gleason, M.D.
GRINDER, 18' x 30' x 96' Norton Cyl., M.D.
LATHE, Driving Wheel, 78" Bement, Dbl. End.
PRESS, Hydr., 1000 ton Wood, platen 42" x 9'.
SLOTTER, 15" Dill Table Dia. 34".
STRAIGHTENER, 12-roll Kane & Roach, M.D.

LANG MACHINERY COMPANY
28th St. & A.V.R.R. Pittsburgh, Pa.

GUARANTEED USED MACHINE TOOLS

DRILLS

1 spdl. Leland-Gifford
2 spdl. Leland-Gifford Bench
4 spdl. Sigourney (4)
4 spdl. Woodward & Rogers
4 spdl. Henry & Wright (19)

GEAR CUTTERS

No. 60BM Gould & Eberhardt Bevel Gear Rougher (2)

GRINDERS

(See page 241 Hill-Clarke Cylindrical Grinders)
No. 40 Bryant Plunge Cut, Wide Wheel, Oscillating
No. 10 Lees-Bradner Spur Gear Grinder
1½" dia. New Yankee Drill Grinder

TURRET LATHES

5—2L Gisholt—Timken bearing
1—3L Gisholt

HILL-CLARKE MACHINERY CO.
649 Washington Boulevard
Chicago, Illinois

EASTERN OFFERS FROM STOCK

PLANERS
24"x24"x5' G. A. Gray, 1 head
24"x24"x6' G. A. Gray, 1 head
26"x26x8' Niles, 1 head
30"x30"x10' American, 1 head
36"x36"x8' Ohio, 1 head
36"x36"x10' Niles, 2 heads
96"x75"x18' Pond, 4 heads

PRESSES
Waterbury-Farrel D.C. O.B.
D2 Ferracute S.A. Drawing
P2 Ferracute Stiles Type
No. 6 Waterbury-Farrel D.C.
851 Ferracute D.C.
No. 2 Langelier
No. 496D Toledo D.C. Toggle Drawing, 8' between housings, wt. 160,000 lbs.
No. 268¼B Toledo D.C. Toggle Drawing, 84" between housings, wt. 175,000 lbs.
Metalwood Hydro Pneumatic type B45
Metal wood Hydro Pneumatic, type B33
No. 0 Springfield Bench Type Straightening
30 ton Lourie type BX Hydraulic
300 ton Niles Horizontal Wheel Press, 48" between strain bars

PUNCHES AND SHEARS
Cleveland EF D.E., 1½" thru 1"
No. 6 Long & Allstatter S.E., ½" thru ¼"
Robinson, 1" thru 1"
No. 2 Robinson, 1¼" stroke
No. 2 Niagara Bench Type, hand

RIVETERS
¼" Shuster, belt
Hanna Air, 13" throat
John Adt, ¼"
Hanna Air, 8" throat
Pedrick & Ayer, 6" throat, air
No. 3A, 5A High Speed Riveters
Chicago Pneumatic Air, 24" throat

SAWS
6" Avey Milband, s.p.d.
Klemm Tilting, 6x6"
5" Newton Cold Cut-off, s.p.d.
6x6" Racine Hack
No. 2B, 4, 5, 6 Cochran-Bly Cold Saws
8" Nutter & Barnes Cold, m.d.
No. 11½, 16" Higley Cold
No. 15 Lea Simplex Cold

BALL BEARING DRILLS
1 spindle Allen
Automatic Sensitive, m.d.
No. ½ Avey
No. 2, 3 Avey
1 spindle Henry & Wright Class K
1 spindle Henry & Wright Class L
Mason Bench Type
2 spindle Sigourney
3 spindle Barr
3 spindle Henry & Wright
4 spindle 13" Fosdick
4 spindle No. 2 Fosdick, p.f.
4 spindle Gardam
4 spindle Henry & Wright
4 spindle Kokomo
6 spindle Henry & Wright
7 spindle Barr

MULTIPLE SPINDLE DRILLS
3 spindle Rockford 12" Gang
5 spindle Detroit Horizontal
6 spindle National Acme
No. 008 Garvin Horizontal Duplex
No. 1 Pratt & Whitney 2 spindle Gun Barrel
No. 1 Baush, m.d., rect. head (4)
No. 2 Baush, m.d., rect. head (2)
No. 2 Baush, m.d., rect. head (2) hydraulic
No. 2 Baush, m.d., rect. head, tapping
No. 3 Baush, m.d., rect. head (3)
D2 Fox Straight Line
No. 7D Moline 2 spindle Cylinder Borer
D11 Fox, rect. head
No. 11 Pratt & Whitney, rect. head
No. 22AC Fox, round head
No. 26C Fox Tapper, 50 spindles
No. 37 Natco, m.d., rect. head
No. 51C Harrington, sq. head

UPRIGHT DRILLS
10", 22" Barnes
10", 12 Barr
12", 14" Mechanics
22", 24" Aurora
22" Barnes All Geared Self-Oiling
24" Cincinnati Bickford, box column, m.d.
24" Milwaukee
24" Hoefer
25" Superior

Many other machines in stock.
Send us your inquiries

The
EASTERN
MACHINERY CO.
1004 TENNESSEE AVE.
CINCINNATI, OHIO

MOREY
DEPENDABLE USED MACHINES

La POINTE No. 2 Double Spindle Broach Motor Drive
GOULD & EBERHARDT 48" Gear Cutter
GOULD & EBERHARDT 36B Spur & Bevel Gear Cutter
WHITON No. 15 Auto. Gear Cutter
FELLOWS No. 6 Gear Shaper
GLEASON 37" Bevel Gear Planer
GLEASON 10" Spiral Bevel Gear Generator
GLEASON 6"-18" Bevel Gear Generators
HEALD No. 70A Duplex Internal Grinder
LANDIS 3½" Internal Hydraulic Race Grinder
NORTON 16"x50" Crankshaft Grinder—M.D.
HEALD No. 60 Internal Grinder
INGERSOLL 24" Cutter Grinder
GARDNER No. 6 Dble. End BB Disc Grinder
PRATT & WHITNEY 6" x 132" Thread Miller
AUTOMATIC MACHINE CO. 12"x4' Quick Return Taper and Relieving Type Lathe
BRIDGEFORD 27" x 10' Boring Lathe

BICKFORD
5' Vertical Boring Mill
2 Swivel Heads Motor Drive

P. & W. No. 12 Multi-Spindle Drill
NATCO C-13 Hyd. Multiple Spindle Drill
NATCO C-11C Multiple Spindle Drill
ESPEN LUCAS No. 138 Cold Saw —Cap. 12" Rd.
NEWTON No. 197 & No. 200 Cold Saws
COCHRANE & BLY No. 5 Cold Saw
COULTER 2 Spindle Diamond Borer—M.D.
LANDIS 4" Single Head Bolt Threader
ACME 1" All Steel Upsetter
AJAX 3" All Steel Upsetter
SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
GISHOLT Precision Balancing Machine
LONG & ALSTATTER Double Angle Shears

THIS IS A PARTIAL LIST

• *Write us* •
your Specific Inquiries

MOREY
MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

S. & S. Machinery
for
DEPENDABILITY
Immediate Delivery

LATHES
LeBlond—21" x 10' G.H. Crankshaft
Hendy—12" x 5'
Porter Cable
Lodge & Shipley 14 x 8', M.D.
Porter 14 x 8' M.D.

TURRET LATHES
Jones & Lamson—3 x 36" M.D.
Gisholt—21"—2" through spindle
Gisholt—5¾" through spindle
Garvin—1"
Garvin—1¼"
#6 Warner & Swasey M.D.
Garvin 1⅝"

GEAR CUTTERS
26" Brown & Sharpe
36" Fellows
G.E. 3 x 36" Spur
G.E. 36"

AUTOMATICS
1—#53 National Acme
5—#55 National Acme, M.D.
1—2¼" Gridley Single Spindle
2—Gridley model G ⅝" capacity

MILLERS
#3 Garvin Duplex
3—18" Cincinnati Production
1—12" B & S Production
5—7H Becker Production
1—#3 Van Norman

GRINDERS
Modern—16" x 60" M.D.

SHAPERS
G & E 24" M.D.
G & E 10" M.D.

RADIAL DRILLS
4' Bickford
Foote Burt Heavy Duty Drill

BORING MILLS—HORIZONTAL
4" Single Pulley Driven Bickford
2" Binsee

MISCELLANEOUS
American Planer 36" x 36" x 8', 2 Heads on rail M.D.
10' Geo. A. Ohl Power Shear 14 Gauge
36" Throat Heavy Duty Punch, M.D.
1000 Lb. Chambersburg Steam or Air Hammer, Single Frame
10" & 12" Slotters—Newton
16" Beasley Ball Bearing Grinder
3—Form Rolling Machines (5 sets of Form Rollers)
1—Heller Motor Driven Cold Saw with 24" Blades ard 1 Machine to grind Saws for same.
Thompson Spot Welder—50 KVA Air operated.

This is only a partial list
Contact us for rebuilt machinery

S. & S. MACHINERY CO.
207 CENTRE STREET
NEW YORK, N. Y.
WOrth 4-5710

UNUSUAL VALUES

12"x6' Seneca Falls lathe, loose change gear
3⅛" x 50" Fitchburg Lo-swing Lathe.
Turret, Lodge & Davis, Brass cross slide turret.
Brake: Robinson toggle 5'
Drill Presses: 25", 24" Hoefer; 25", 20", 40" Bement
Ceiling Suspended Drill Unlimited drilling area
Grinders: #20 Bryant Internal
60" Plate grinders.
#60 Heald cylinder grinders.
Sellers Tool Grinder
300 other machinery items
Rock River ⅞" capacity punch and shear
1—3-spindle 1" capacity Bolt Cutter.
1—2-spindle #0 Webster & Perks Threader.
Bolt Cutter 1¾ Acme with Landis Head.
Vacuum Cleaner, Invincible, shop size.
2—⅞" capacity Punch and Shears.
MOTORS—new 5 H.P. for 3-phase, ball brg. Also rebuilt motors.

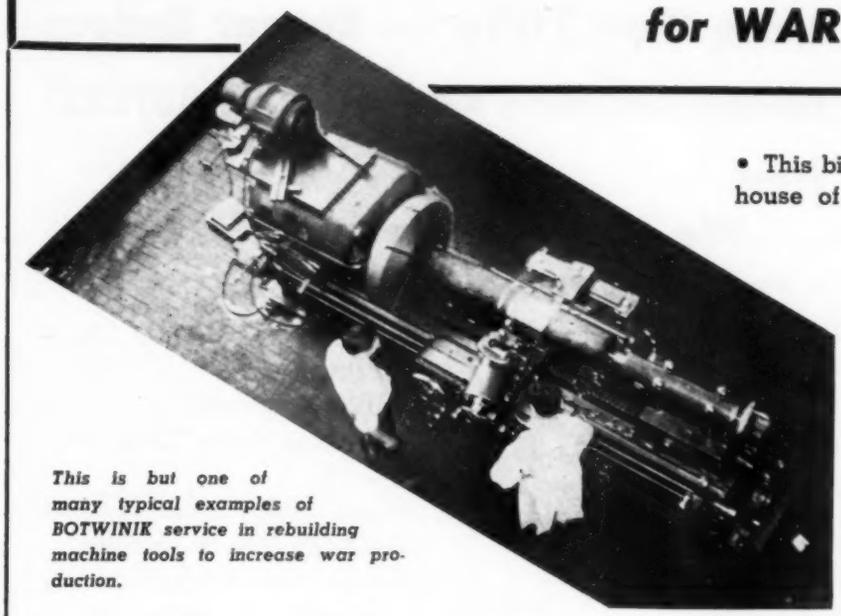
THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

500# D&S Board Drop Hammer.
800# B & S Board Drop Hammer.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
50" G & E Gear Cutter.
4' Bickford Radial Drill.
#55 Heald Internal Grinder.
10' Bridgeport Knife Grinder.
20"-24" G & E Shapers.
36" Morton Draw Cut Shaper.
No. 2 Baker Keyseater, 2"x20".

WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

BOTWINIK REBUILDS

for WAR PRODUCTION



This is but one of many typical examples of BOTWINIK service in rebuilding machine tools to increase war production.

• This big lathe was lying idle in the warehouse of a large manufacturing plant because it was not considered serviceable. However, it was shipped to the BOTWINIK plant, dismantled, and completely rebuilt. It was then returned to its owner and placed on the production line.

Today this lathe is busy working twenty-four hours a day, seven days a week on important war work. BOTWINIK rebuilding made this possible.

BOTWINIK BROTHERS, INC., 373 WELTON STREET **NEW HAVEN, CONN.**

OTT MACHINERY SPECIALS

AUTOMATICS, Cleveland, 1-1/16", Model A
AUTOMATICS, Gridley, 2¼, 3¼ & 4¼" S.S.
AUTOMATICS, Cleveland ⅞ & 2½" Model B
AUTOMATICS, Cleveland ⅞" Model M, 4 spdle.
AUTOMATICS, #22, 23 & 24 New Britain
GRINDERS, Norton, 10 & 14x36" Plain

60" x 17' Putnam Lathe with 12" Riser Blocks, total swing 85" M.D.

LATHE, 3x36" J.&L. Dble. Spdle.
MILLING MACHINES, Craftsman #1, 2 & 3
PLANERS, Bedford & Patch, 36"x13' Open Side with 1 Rail & 1 Side Head
PRESSES, Toledo, #34 Solid Back, S.G.
PRESSES, Toledo #2 to 5 Open Back Inclinable
PRESSES, Ferracute, P2, 3 & 4, Solid Back

OTT MACHINERY SALES, INC.
542 Second Ave. Detroit, Mich.

AUTOMATICS, 6" x 6¾" Goss & De Leeuw, #34 New Britain Chucker
BOLT AND PIPE THREADERS—1½" Landis Dble. Hd. Bolt; 1½" & 3" National; 10" & 6" Saunders Pipe.
BORING MILLS—84" N.B.P. 2 hds., M.D.; 72" Betts, M.D.; 42" Bullard New Era Type, 42" Gisholt, 2 hds; 36" and 24" Bullard New Eras.
GRINDERS—30" x 240" Landis Cyl. 24" Bridgeport Disc D.C., M.D. 24" x 96" Landis Cyl.; 20" x 96" Landis Cyl.; 14" x 96" Cinci. M.D.; 12" x 96" Landis; 12" x 120" Landis; 10" x 24" Landis Univ., M.D.; 6" x 18" Landis Pl., M.D.
GEAR CUTTERS—11" & 6" Gleason Bevel Gear Generators (4); 36" G & E Spur and Bevel. 48" & 36" Cinci spur (2), 60" Gould & Eberhardt, spur.
KEYSEATERS—#1 Baker, 12" stroke x 1½" wide. #6 Catlin 40" stroke x 5" wide; #4 Mitts & M.
PLANERS & SHAPERS—38" x 38" x 16' Ingersoll, 4 hds.; 30" x 30" x 10' Cleveland openside, 1 rail and 1 side hd., M. D.; 30" x 30" x 10' Gray, 1 hd. 36" x 36" x 10' Flather, 2 hds., M.D.., 26" x 8' Gray; 16" Gould & Eberhardt.
RADIAL DRILLS—6' & 5' N.B.P. Plain.
LATHES—24" x 14' Schumacher Boye, T.A.; 26" x 16' Putnam, T.A.; 30" x 10' Pittsburgh, blocks to 42"; 64" x 28' New Haven.
TURRET LATHES—#3A Warner & Swasey, 4⅝" hollow spindle, arranged bar work.

ROSENKRANZ MACHINERY CO.
30 Church Street New York, N. Y.

FOR SALE

New Britain Automatics (Chucking)
Natco & Baush Multiple Drills Vertical & Horizontal
Pratt & Whitney Gun Drills
Upright Drills Plain & Sensitive
Fitchburg Plain Cylindrical **Grinders** 8x20
Gardner #24 Vertical Disc **Grinder** 53"
Polishing Stands and Double End **Grinders**
Barnes 214 **Honing Machines,** 8-Spindle
Hamilton Automatic Lathe Front and Rear Cross Slides
Ingersoll 6 Station Drum Type **Mill** 84"x115
Ingersoll Profile and **Angular Mills**
Oil Separators—for Block Test—Motorized
Electric Flywheel Ring Gear **Heater & Press**
Bradley Diagraph **Stencil Machine**
Hannifin Bench Air Arbor Presses 8"x24"
56-E **Toledo Presses**
Bliss #1½ and #2½ **OBI Presses Consolidated**
Riveters—Penn, Hanna and Chicago Pneumatic
New Haven Sand Blasters
Garvin Tappers
Lees Bradner Thread Mill
Spot-Welders, Federal & Toledo
Complete Blueprinting Machine

HUPP MOTOR CAR CORPORATION
DETROIT, MICHIGAN

LATHE (Rebuilt)

25/27½"x26' (20' centers) LeBlond Heavy Duty, 3-step cone, D.B.G., Quick change Gears, with self-contained motor drive, 7½ HP. 3/60/220 and equipped with 24" chuck. Ready to ship. Fob. Cleveland, O.

SCREW MACHINE

1½" Cleveland Model B single spindle, automatic chuck with 8 collets; milling slide, double. cross slide, overhead cam cutter, pump and change gears. Serial 30382.

Has seen little service. Immediate delivery.

GALBREATH MACHINERY CO.
Empire Building PITTSBURGH, PA.

Announcing Our New Location

6—Gleason Gear Cutters, 11" and 18" machines
52x20' New Haven Lathe
48" Boring Mill
12—25 KVA Spot Welders
48x8 Planer
500# Board Drop Hammer
1000# Steam Hammer
Cleveland Automatics—⅞", 2¼", 2⅝", single spindle
Arter Grinder, 6x20, cylindrical

Paul's Motor & Machinery Supply Company
6111 Vermont St. Detroit, Michigan
Tyler 76300-02

METAL PLANER

36"x36"x14' WOODWARD & POWELL Metal Planer, one head on cross rail and one side head. Width of table—32¼". Thickness of table—4⅛".
Equipped with power lift for the cross rail.
Arranged for self-contained belted motor drive, including motor platform and countershaft.

ALSO MANY OTHER TOOLS
ALEX ZEEVE & COMPANY
2269 Woolworth Building New York, N. Y.

Have your
used MACHINE TOOLS thoroughly REBUILT
in our *specially equipped*
14,000 sq. ft. factory
Precision work • Prompt delivery
Free estimates

EAST RIVER MACHINERY CORP.

432 Bryant Ave., Bronx, N. Y.
Tel: DAyton 3-4246
City office: 1501 Broadway, New York
Tel: PEnnsylvania 6-4430

Now available for sale:

LATHES:
14"x5' WITCOMB & BLAISDEL—geared hd.
14"x6' FLATHER, g.e.
14"x8' AMERICAN, g.e., taper attachment
16"x10' SIDNEY, g.e.
16"x8' SOUTH BEND, g.e.
18"x8' AMERICAN — geared head, taper attachment
22"x10' HAMILTON—geared head, M.D.
24"x7' UNIVERSAL—geared head, M.D.
24"x10' LEBLOND Heavy Duty
36"x18' LODGE & SHIPLEY, quick change
12"x5' CLAUSING Lathe, g.e. (almost new)

MILLING MACHINES:
#4 Universal PEDRICK & AYRES
#3 Universal KEMPSMITH
#2 Universal ROCKFORD
#2 Universal OSTERLEIN
#25 Plain BECKER
#5C Vertical BECKER
#1 Vertical BECKER

BORING MILLS:
42" COLBURN—2 hds, M.D.
72" BULLARD—2 hds, M.D.

TURRET LATHES:
#3 WARNER & SWASEY
⅞" WARNER & SWASEY—Fox Type
3"x36" J & L, Double spindle, M.D.
3"x36" J & L, M.D.
2¼"x24" J & L, M.D.
2 L GISHOLD, geared head, 3½" cap.

PLANERS:
36"x36"x12' WOODWARD & POWEL, 2 Hds.
42"x42"x18' BETTS, 2 Hds.

GRINDERS:
#3 14x53 MODERN Universal Cylindrical, M.D.
#2 10x25 BATH Universal
#2 O.S. WALKER Tool & Cutter grinder
23x52 LANDIS Plain Cylindrical

MISCELLANEOUS:
4' PRENTICE Radial Drill
4' AMERICAN Triple Purpose
5' CINCINNATI Radial Drill
36" PUTNAM H.D. Drill Press
24" NILES B.G. Drill Press
#21 BLISS Press
#0 BLISS Press
2½ Stroke NIAGARA Press

LATHES
No. 324 Adriance Spinning

MILLING MACHINES
2" Pratt & Whitney spline (duplex) (Double)
No. 1 Foote-Burt Surface Broach
No. No. 3 Wigglesworth
No. 2 Knight Vertical
No. 30 Sundstrand Rigid Mill M.D.

TURRET LATHE
Goss & De Leeuw Chucking, 6"x6½".

DRILLS
No. B16 Natco M.D. (2).
No. B13, Natco, M.D.
4 Spindle Taylor & Fenn M.D.
6' Cincinnati Bickford Radial.

GEAR MACHINERY
6 Cimatool chamfering M.D.
No. 4—48" Brown & Sharpe Gear Cutter
Lees Bradner Gear Grinders (2)
9" Pratt & Whitney Gear Grinder

MISCELLANEOUS
8" Bullard Multimatic M.D.
No. 1 Foote-Burt Duplex Surface Broach
21"x21"x5' Whitcomb Planer
24x24x8 Whitcomb Planer
36"x36"x8 Woodward & Powell Planer Rev. M.D.
No. 303 Bliss St. Side Gd. M.D.
2" Acme Belt Threader

WIGGLESWORTH MACHINERY CO.

203 Bent St., Cambridge, Mass.

OVER ONE MILLION DOLLARS SALES IN 1942

More than 70% on Repeat Orders

Hasco's Customers ARE SATISFIED BUYERS!

Now

We offer for sale from Stock:

IMMEDIATE DELIVERY

Becker #6 Vertical Miller
Le Blond Turret Engine Lathe, 28" swing, grd. hd.
Cincinnati Planer, 24"x8', mtr. drive
Cincinnati #4 Vertical Miller, all geared (incomplete)
National Acme, 4 spindle, automatic #515
Gridley 4½", 4 spindle, automatic chucker late type)
Becker #3 Vertical Miller
Garvin 30" Vertical Drill Press
Garvin #4 Profiler
Sipp High Speed Drill, mtr. drive
Natco 20 Sp. Multiple Drill
Baush #4 MS, 30 spindles
Landis 10x36 Hydraulic Plain Grinder, 3 motor drive, new in 1936
Cincinnati Gear Hobbers, 16" cap.
Fellows #6 Gear Shaper

Surprisingly Low Prices

SPECIAL Betts Vertical Boring Mill 10'x15', 2 heads on rail —AC variable mtr. drive

JOIN THE HASCO CROWD OF SATISFIED CUSTOMERS

HASCO Machinery Company

New & Used Equipment
661-671 Frelinghuysen Ave.
Newark, N. J.

Your Old Machine Tools

Completely Rebuilt & Modernized for War Production

WRITE • PHONE • WIRE

RIVERSIDE MACHINERY CO., Inc.

133 MULBERRY ST. (WOrth 4-5711) NEW YORK CITY

WHERE-TO-BUY DIRECTORY

ABRASIVE GRAIN & STONES, (See GRAINS, Abrasive)

ABRASIVE PAPERS & CLOTH (See PAPER & CLOTH, Abrasive)

ADHESIVES Abrasive-disc
Distic Mfg. Co., Albany, N. Y.

ALLOYS, Aluminum (See ALUMINUM)

ALLOYS, Copper
American Brass Co., Waterbury, Conn.
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., New Castle, Pa.
Revere Copper & Brass Inc., N. Y. C.

ALLOYS, Corrosion & Heat Resistant
Allegheny-Ludlum Steel Corp., Pittsburgh
Aluminum Co. of America, Pittsburgh
American Brass Co., Waterbury, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Bunting Brass & Bronze Co., Toledo, O.
Carboloy Co., Detroit
Carnegie-Illinois Steel Corp., Pittsburgh
Carpenter Steel Co., Reading, Pa.
Dow Chemical Co., Midland, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes-Stellite Co., N. Y. C.
Latrobe Electric Steel Co., Latrobe, Pa.
Mallory & Co., Inc., P. R., Indianapolis
Republic Steel Corp., Cleveland
Revere Copper & Brass, Inc., N. Y. C.
Ryerson & Son, Inc., Jos. T., Chicago
Timken Steel & Tube Div., Canton, O.

ALLOYS, Magnesium
American Magnesium Co., Pittsburgh
Dow Chemical Co., Midland, Mich.

ALLOYS, Special Iron
American Brake Shoe & Fdry. Co., N.Y.C.
Meehanite Research Institute, Pittsburgh

ALLOYS, Steel
Allegheny-Ludlum Steel Corp., Pittsburgh
Bethlehem Steel Co., Bethlehem, Pa.
Boker & Co., Inc., H., N. Y. C.
Carnegie-Illinois Steel Corp., Pittsburgh
Carpenter Steel Co., Reading, Pa.
Climax Molybdenum Co., N. Y. C.
Columbia Steel Co., San Francisco
Copperweld Steel Co., Glassport, Pa.
Disston & Sons, Inc., Henry, Philadelphia
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc. Div., Newcastle, Ind.
Jones & Laughlin Steel Corp., Pittsburgh
Latrobe Electric Steel Co., Latrobe, Pa.
Republic Steel Corp., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Timken Steel & Tube Div., Canton, O.
Union Drawn Steel Co., Massillon, O.
United States Steel Corp., Pittsburgh
Vanadium-Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy Co., Inc., Cambridge, Mass.
Wyckoff Drawn Steel Co., Pittsburgh

ALUMINUM
Aluminum Co. of America, Pittsburgh

ANODES & CATHODES
American Brass Co., Waterbury, Conn.
Revere Copper & Brass, Inc., N. Y. C.

ARBORS & MANDRELS
Atkins & Co., E. C., Indianapolis
Brown & Sharpe Mfg. Co., Providence, R. I.
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Detroit
Cincinnati Milling Mach. Co., Cincinnati
Cleveland Twist Drill Co., Cleveland
Cushman Chuck Co., Hartford, Conn.
Disston & Sons, Inc., Henry, Philadelphia
Firth-Sterling Steel Co., McKeesport, Pa.
Gisholt Machine Co., Madison, Wis.
Gleason Works, Rochester, N. Y.
Greenfield Tap & Die Corp., Greenfield, Mass.
Illinois Tool Works, Chicago
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Corp., Milwaukee
Kent-Owens Machine Co., Toledo, Ohio
Latrobe Electric Steel Co., Latrobe, Pa.
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Tool Co., Cleveland, O.
National Twist Drill & Tool Co., Detroit
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Pratt & Whitney Div., Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Sundstrand Mach. Tool Co., Rockford, Ill.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth, Mich.
Warner & Swasey Co., Cleveland

ATTACHMENTS, Broaching Machine
Colonial Broach Co., Detroit

ATTACHMENTS, Grinding Machine
Abrasive Mach. Tool Co., E. Providence, R. I.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati
Covel Mfg. Co., Benton Harbor, Mich.
Detroit Universal Duplicator Co., Detroit
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Landis Tool Co., Waynesboro, Pa.
Liberty Tool & Gage Wks., Providence, R. I.
Norton Co., Worcester, Mass.
Thompson Grinder Co., Springfield, O.
Weldon Tool Co., Cleveland

ATTACHMENTS, Lathe
American Tool Works Co., Cincinnati
Ames Co., B. C., Waltham, Mass.
Atlas Press Co., Kalamazoo, Mich.
Auto Ordnance Corp., Bridgeport, Conn.
Bradford Machine Tool Co., Cincinnati
Cincinnati Lathe & Tool Co., Cincinnati
Detroit Universal Duplicator Co., Detroit
Dumore Co., Racine, Wis.
Experimental Tool & Die Co., Detroit
Gisholt Machine Co., Madison, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
Hendey Machine Co., Torrington, Conn.
Jefferson Mach. Tool Co., Cincinnati
LeBlond Mach. Tool Co., R. K., Cincinnati
McCrosky Tool Corp., Meadville, Pa.
Monarch Machine Tool Co., Sidney, O.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Reed-Prentice Co., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Boston
Rockford Mach. Tool Co., Rockford, Ill.
South Bend Lathe Wks. So. Bend, Ind.
Strand Co., N. A. Chicago
Warner & Swasey Co., Cleveland

ATTACHMENTS, Milling
Atlas Press Co., Kalamazoo, Mich.
Auto Ordnance Corp., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Lathe & Tool Co., Cincinnati
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Detroit Universal Duplicator Co., Detroit
Fray Machine Tool Co., Glendale, Calif.
Jefferson Mach. Tool Co., Cincinnati
Lempco Products, Inc., Bedford, O.
Kearney & Trecker Corp., Milwaukee
Kempsmith Machine Co., Milwaukee
National Machine Tool Co., Cincinnati
Porter-Cable Mach. Co., Syracuse, N. Y.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Machine Tool Co., Springfield, Mass.

ATTACHMENTS, Planer
Cincinnati Planer Co., Cincinnati
Sellers & Co., Inc., Wm., Philadelphia

ATTACHMENTS, Screw-Machine
Brown & Sharpe Mfg. Co., Providence, R. I.
Empire Tool Co., Detroit
Meisel Press Mfg. Co., Boston

ATTACHMENTS, Tapping
Avey Drilling Mach. Co., Cincinnati
Barber-Colman Co., Rockford, Ill.
Errington Mech. Lab., Stapleton, N. Y.
Greenlee Bros. & Co., Rockford, Ill.
Haskins Co., R. G., Chicago
Kingsbury Mach. Tool Corp., Keene, N. H.
Moline Tool Co., Moline, Ill.
Murchey Machine & Tool Co., Detroit
National Auto. Tool Co., Richmond, Ind.

BABBITT (See METALS, Bearing)

BALANCING MACHINES
Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Snyder Tool & Engrg. Co., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

BALLS, Brass, Bronze & Steel
Ball & Roller Bearing Co., Danbury, Conn.
Federal Bearings Co., Poughkeepsie, N. Y.
S.K.F. Industries, Inc., Philadelphia
Waterbury Steel Ball Co., Poughkeepsie, N. Y.

BARRELS, Tumbling & Burnishing
Waterbury Steel Ball Co., Poughkeepsie, N. Y.

ALLOY

S.A.E. HY-TEN N.E.

STEELS

We solicit your inquiries

Even though warehouse stocks today are not as plentiful as you and we would like there are still a substantial number of sizes in a variety of analyses available for immediate shipment. We will do everything within our power to help you make the guns and tools and ships and planes and tanks which will win the war.

Wheelock, Lovejoy & Co., Inc.

Main Offices: 137 Sidney St. Cambridge, Mass.

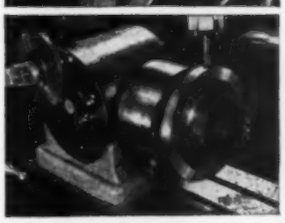
Cleveland, Chicago, Newark, Detroit, Buffalo, Cincinnati

4 of the many ways

SLOTMASTER can be used to save TOOLS & SETUPS

(a) Left: Set-up for cutting a spline in an adapter

(b) Below: Set-up for cutting an internal gear



SLOTMASTER can be used on any round or flat-on round over-arm milling machine and will do precision work that normally requires a multi-thousand dollar machine (all of the working parts are of tool steel, heat treated). It takes but little time to change over from one head to the other . . the stroke of the ram is adjustable from 0 to 4" . . the speeds range from 50 to 250 s.p.m. The tool holder is of the clapper box type and can be turned in any position. SLOTMASTER comes complete with pulleys, motor, mounting bracket etc.

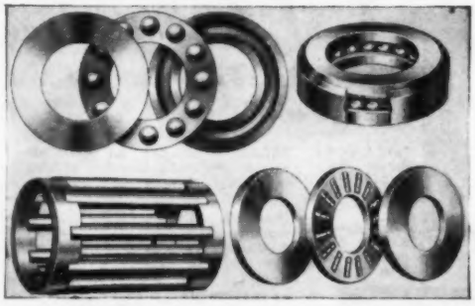
Send for 4-page catalog—give specifications of the milling machines you wish to equip. Immediate deliveries on high priorities.

EXPERIMENTAL TOOL & DIE COMPANY

12615 Greiner Detroit, Michigan

(c) Below: Conventional set-up on a round over-arm milling machine—thumbnail shows a set-up for shaping a feed cam.

CRITERION
Boring Heads
Speed
PRODUCTION
These Criterion heads save time! Smooth, compact, rigid! Large, easy-to-read, graduated dial. Lead screw is hardened tool steel. ITS THREADS ARE GROUND FROM THE SOLID AFTER HARDENING, assuring constant accuracy. Parts subject to wear are hardened. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3" ½" and 1" bar capacity Ask your dealer, or order direct. Request free literature.
CRITERION MACHINE WORKS
BEVERLY HILLS CALIFORNIA
NEW YORK OFFICE 205 E. 42ND ST., N. Y.



B & R BEARINGS

IMMEDIATE SERVICE

Bearings of standard sizes as illustrated are carried in stock. Catalog and discounts gladly furnished on request.

THE BALL & ROLLER BEARING CO., Danbury, Conn.

ACCURACY

ATOMETRIC GAGE BLOCKS

PERFECTION IN MEASUREMENT
MEANS
PERFECTION IN YOUR PRODUCT

ATOMETRIC PRECISION GAGE LABORATORIES, Inc.
STAMFORD, CONNECTICUT, U. S. A.

WHERE-TO-BUY DIRECTORY

BARS, Boring
Armstrong Bros. Tool Co., Chicago
Barber-Colman Co., Rockford, Ill.
Bullard Co., Bridgeport, Conn.
Carboloy Co., Detroit
Elmes Engrg. Wks., Chas. F., Chicago
Fray Machine Tool Co., Glendale, Cal.
Gairing Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Lucas Machine Tool Co., Cleveland
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Scully-Jones & Co., Chicago
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Boring Mach. Co., Hudson, Mass.
Warner & Swasey Co., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

BARS, Sine
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

BATHS, Heat Treating & Annealing
Houghton & Co., E. F., Philadelphia

BEARINGS & BUSHINGS
Aluminum Co. of America, Pittsburgh
Bunting Brass & Bronze Co., Toledo, O.
Carlyle Johnson Machine Co., Manchester, Conn.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Babbitt
Bunting Brass & Bronze Co., Toledo, O.
Dodge Mfg. Corp., Mishawaka, Ind.

BEARINGS, Ball
Ball & Roller Bearing Co., Danbury, Conn.
Bantam Bearings Corp., So. Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Dodge Mfg. Corp., Mishawaka, Ind.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Poughkeepsie, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
S. K. F. Industries, Inc., Philadelphia
Schatz Mfg. Co., Poughkeepsie, N. Y.
Torrington Co., Torrington, Conn.

BEARINGS, Needle & Quill
Bantam Bearings Corp., So. Bend, Ind.
Federal Bearings Co., Poughkeepsie, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Roller Bearing Co. of Amer., Trenton, N. J.
S. K. F. Industries, Inc., Philadelphia
Torrington Co., Torrington, Conn.

BEARINGS, Non-Metallic
Bakelite Corp., N. Y. C.

BEARINGS, Oilless & Graphite
Bunting Brass & Bronze Co., Toledo, O.
Carlyle Johnson Machine Co., Manchester, Conn.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Roller
Ball & Roller Bearing Co., Danbury, Conn.
Bantam Bearings Corp., So. Bend, Ind.
Dodge Mfg. Corp., Mishawaka, Ind.
Fafnir Bearing Co., New Britain, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Roller Bearing Co. of Amer., Trenton, N. J.
S. K. F. Industries, Inc., Philadelphia
Timken Roller Bearing Co., Canton, O.

BEARINGS, Thrust
(See preceding classifications)

BELLOWS, Seamless Metal
Chicago Metal Hose Corp., Maywood, Ill.

BELTING, Leather
Greene, Tweed & Co., N. Y. C.
Houghton & Co., E. F. Philadelphia
Rhoads & Sons, J. E., Philadelphia, Pa.

BELTING, Rubber & Fabric
Dayton Rubber Mfg. Co., Dayton, O.
Gates Rubber Co., Denver, Col.

BELTS & BANDS, Abrasive
Behr-Manning Corp., Troy, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Dumore Co., Racine, Wis.
Norton Company, Worcester, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Walls Sales Corp., N. Y. C.

BELTS "V"
Allis-Chalmers Mfg. Co., Milwaukee
Dayton Rubber Mfg. Co., Dayton, O.
Dodge Mfg. Corp., Mishawaka, Ind.
Gates Rubber Co., Denver, Col.
Rhoads & Sons, J. E., Philadelphia, Pa.

BENCHES, Shop
Baumbach Mfg. Co., E. A., Chicago
Delta Mfg. Co., Milwaukee
Hardinge Brothers, Inc., Elmira, N. Y.
Hill Acme Co., Cleveland
New Britain-Gridley Machine Div., New Britain, Conn.
Rivett Lathe & Grinder, Inc., Boston
Standard Pressed Steel Co., Jenkintown, Pa.
Walker-Turner Co., Plainfield, N. J.

BENDERS, Hand
O'Neil-Irwin Mfg. Co., Minneapolis

BENDING & STRAIGHTENING, Machines
Baldwin-Southwark Corp., Philadelphia
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati
Cleveland Punch & Shear Wks., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Elmes Engrg. Works, Chas. F., Chicago
Farrel-Birmingham Co., Ansonia, Conn.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Ryerson & Son, Inc., Jos. T., Chicago
Schatz Mfg. Co., Poughkeepsie, N. Y.
Springfield Mach. Tool Co., Springfield, O.
Watson-Stillman Co., Roselle, N. J.

BINS, Tool & Parts (See LOCKERS & SHELVING)

BITS, Tool
Allegheny-Ludlum Steel Corp., Pittsburgh
Armstrong Bros. Tool Co., Chicago
Barber-Colman Co., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carboloy Co., Detroit
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., Cleveland
Colonial Broach Co., Detroit
Crafts Co., Inc., Arthur A. Boston
Disston & Sons, Inc., Henry, Philadelphia
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Latrobe Electric Steel Co., Latrobe, Pa.
McCrosky Tool Corp., Meadville, Pa.
McKenna Metals Co., Latrobe, Pa.
Michigan Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Broach & Machine Co., Detroit
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Ready Tool Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Union Twist Drill Co., Athol, Mass.
Vanadium Alloys Steel Co., Pittsburgh
Vascoloy-Ramet Corp., N. Chicago, Ill.
Warner & Swasey Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.
Williams & Co., J. H., Buffalo, N. Y.

BLADES, Circular-Saw (See SAW BLADES, Circular)

BLADES, Cutter, Milling, Boring & Reaming (See BITS, Tool)

BLADES, Hack- & Band-Saw
Armstrong-Blum Mfg. Co., Chicago
Atkins & Co., E. C. Indianapolis
Capewell Mfg. Co., Hartford, Conn.
Clemson Bros., Inc., Middletown, N. Y.
Continental Machines, Inc., Minneapolis
Disston & Sons, Inc., Henry, Philadelphia
Racine Tool & Mach. Co., Racine, Wis.
Starrett Co., L. S., Athol, Mass.
Thompson & Sons Co., Henry G., New Haven, Conn.
Victor Saw Works, Middletown, N. Y.

BLOCKS, Pillow
Allis-Chalmers Mfg. Co., Milwaukee
Dodge Mfg. Corp., Mishawaka, Ind.
Earle Gear & Mach. Co., Philadelphia
Fafnir Bearing Co., New Britain, Conn.
Farrell Birmingham Co., Ansonia, Conn.
Hill Acme Co., Cleveland
Norma-Hoffmann Bearings Corp., Stamford, Conn.

WHERE-TO-BUY DIRECTORY

S. K. F. Industries, Inc., Philadelphia
Standard Pressed Steel Co., Jenkintown, Pa.

BLOCKS, Precision Gage
Atometric Precision Gage Laboratories, Inc., Stamford, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., Dearborn, Mich.
Jansson Gage Co., Detroit.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., Watertown, Mass.
Webber Gage Co., Cleveland

BLOCKS, "V"
Brown & Sharpe Mfg. Co., Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Corp., Dayton, O.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

BLOWERS
Allis-Chalmers Mfg. Co., Milwaukee
American Gas Furn. Co., Elizabeth, N. J.
Buffalo Forge Co., Buffalo, N. Y.
General Electric Co., Schenectady, N. Y.
Strong, Carlisle & Hammond Co., Cleveland
Wagner Electric Corp., St. Louis

BLOWERS, Electric Hand
Buffalo Forge Co., Buffalo, N. Y.
Ideal Commutator Dresser Co., Chicago
Skilsaw, Inc., Chicago

BLUEPRINTING MACHINERY & ACCESSORIES
Wikes Bros., Saginaw, Mich.

BLUING, Layout
Dykem Co., St. Louis

BOLT & NUT MACHINES
Cleveland Automatic Mach Co., Cleveland
Cone Automatic Mach. Co., Windsor, Vt.
Consolidated Machine Tool Corp., Rochester, N. Y.
Eastern Machine Screw Corp., New Haven, Conn.
Federal Press Co., Elkhart, Ind.
Foote-Burt Co., Cleveland
Geometric Tool Co., New Haven, Conn.
Goss & deLeeuw Machine Co., New Britain, Conn.
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haskins Co., B. G., Chicago
Hendey Machine Co., Torrington, Conn.
Hill Acme Co., Cleveland
Landis Machine Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit
National Acme Co., Cleveland
New Britain-Gridley Machine Div., New Britain, Conn.
Oster Mfg. Co., Cleveland
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Scherr Co., Geo., N. Y. C.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
W. & O. Press Co., Hudson, N. Y.

BOLTS, Eye & T-Slot
American Chain & Cable Co., Bridgeport, Conn.
Armstrong Bros. Tool Co., Chicago
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

BOLTS & NUTS
Bethlehem Steel Co., Bethlehem, Pa.
Elastic Stop Nut Corp., Union, N. J.
Parker-Kalon Corp., N. Y. C.
Republic Steel Corp., Cleveland
Rhode Island Tool Co., Providence, R. I.
Standard Pressed Steel Co., Jenkintown, Pa.

BORING, DRILLING & MILLING MACHINES, Horizontal
Atlantic Machinery Co., N. Y. C.
Avey Drilling Mach. Co., Cincinnati
Barnes Co., W. F. & John, Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass.
Bryant Machinery & Engrg. Co., Chicago
Buhr Mach. Tool Co., Ann Arbor, Mich.
Cincinnati Gilbert Mach. Tool Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Defiance Mach. Wks., Inc., Defiance, Ohio
DeVlieg Machine Co., Ferndale, Mich.
Foote-Burt Co., Cleveland
General Machy. Corp., Hamilton, O.
Giddings & Lewis Mach. Tool Co., Fond du Lac, Wis.
Greenlee Bros. & Co., Rockford, Ill.
Lucas Machine Tool Co., Cleveland
Moline Tool Co., Moline, Ill.
National Acme Co., Cleveland
National Auto Tool Co., Richmond, Ind.
Ohio Machine Tool Co., Kenton, O.
Sheffield Corp., Dayton, O.
Sellers & Co., Inc., Wm., Philadelphia
Snyder Tool & Engrg. Co., Detroit
Springfield Mach. Tool Co., Springfield, O
Universal Boring Mach. Co., Hudson, Mass.
Yoder Co., Cleveland

BORING MACHINES, Jig (See JIG-BORING MACHINES)

BORING MACHINES, Precision
Barnes Co., W. F. & John, Rockford, Ill.
Bryant Machinery & Engrg. Co., Chicago
Ex-Cell-O Corp., Detroit
Giddings & Lewis Mach. Tool Co., Fond du Lac, Wis.
Heald Machine Co., Worcester, Mass.
Leland-Gifford Co., Worcester, Mass.
Lucas Machine Tool Co., Cleveland
Moline Tool Co., Moline, Ill.
National Auto. Tool Co., Richmond, Ind.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rivett Lathe & Grinder, Inc., Boston
Sheffield Corp., Dayton, O.
Universal Boring Mach. Co., Hudson, Mass.

BORING MILLS, Vertical
Baush Mach. Tool Co., Springfield, Mass.
Bullard Co., Bridgeport, Conn.
Cincinnati Planer Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
King Machine Tool Co., Cincinnati
Sellers & Co., Inc., Wm. Philadelphia
Springfield Mach. Tool Co., Springfield, O.

BOXES, Tote
American Metal Works, Inc., Philadelphia, Pa.
Lucas & Son, Inc., J. L., Bridgeport, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

BRAKES, Bending, Power
Bryant Machinery & Engrg. Co., Chicago
Cincinnati Shaper Co., Cincinnati
Cleveland Crane & Engrg. Co., Wickliffe, O.
Cleveland Punch & Shear Wks. Co., Cleveland

BRAKES, Electric
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., E. Pittsburgh

BRICK, Furnace (See REFRACTORIES)

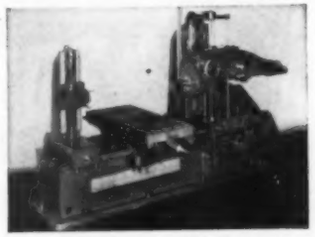
The
"HOUSE OF PRECISION"
★
Jansson Gage Blocks—a good standard for precision measurement. Used by leading armaments manufacturers. Preferred by experienced inspectors for their extreme accuracy.
★
JANSSON
GAGE COMPANY
DETROIT • MICHIGAN

Write for Literature and Prices

19218 GLENDALE AVE.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

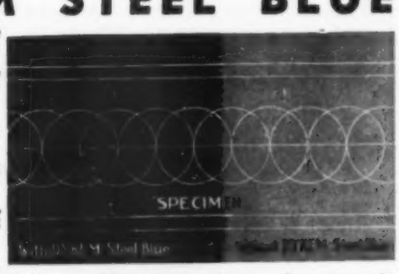
Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates



simply brush on, right at the bench: ready for the lay out in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY, 2301 B N 11th St., St. Louis, Mo.
In Canada: 444 Pacific Ave., Toronto, Ont.

LUCAS "PRECISION"
Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

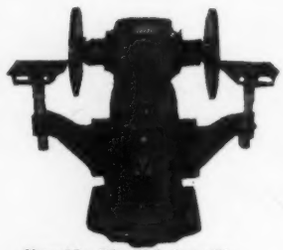
It takes a "Marschke" for Dependable Durability!

New Bottleneck Breakers

Marschke Spot Grinder or Buffer, accurately adjustable as to height and angle.

SEMI-SPECIAL Marschke Grinders and Buffers are handling scores of special war production jobs efficiently. Armor plate and tank turret grinders are the latest, others are pictured here. Every machine is typically smooth running, rugged and dependable, adapted from standard machines by Marschke engineers.

IF YOU HAVE a grinding or buffing bottleneck, ask for suggestions on a Marschke adapted to your special requirements. Or write for Catalog showing over 70 specifications of standard Marschke pedestal, stand and swing frame grinders and buffers.



Marschke Disc Grinder with adjustable work rests.

Marschke Roll Radius Tool Grinder, for machining rolling mill rolls.

Write for Catalog of

THE MARSCHKE LINE

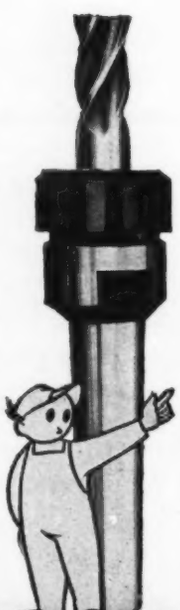
VONNEGUT MOULDER CORP.
1809 Madison Ave.
Indianapolis, Ind.

UNIVERSAL FIRST COMPANY IN AMERICA TO WIN COVETED 20% BOND FLAG

When each of the 550 of us here at Universal helped give the Allied cause a boost by being America's first industrial plant to subscribe 20% for War Bonds we were mighty proud.

But we're even more proud of the big volume of precision built collet chucks we're turning out daily to help America's arms production.

The Universal collet chuck shown here has ground threads, ample room for tool feed out and is ideal for holding end mills, keyway cutters, drills, etc. Write for facts.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN

WHERE-TO-BUY DIRECTORY

BROACHES
American Broach & Machine Co., Ann Arbor, Mich.
Butterfield & Co., Derby Line, Vt.
Carbide Tool Co., Chicago
Colonial Broach Co., Detroit
Dalzen Tool & Mfg. Co., Detroit
Detroit Broach Co., Detroit
Detroit Tap & Tool Co., Detroit
East Shore Mach. Pdts. Co., Cleveland
Ex-Cell-O Corp., Detroit
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Lapointe Mach. Tool Co., Hudson, Mass.
Michigan Tool Co., Detroit
National Broach & Mach. Co., Detroit
National Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

BROACHING MACHINES
American Broach & Machine Co., Ann Arbor, Mich.
Cincinnati Milling Mach. Co., Cincinnati
Colonial Broach Co., Detroit
Consolidated Machine Tool Corp., Rochester, N. Y.
Elmes Engrg. Works, Chas. F., Chicago
Foote-Burt Co., Cleveland
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Lapointe Mach. Tool Co., Hudson, Mass.
Michigan Tool Co., Detroit
National Broach & Mach. Co., Detroit
Thompson Grinder Co., Springfield, O.

BRONZE, Phosphor (See PHOSPHOR BRONZE)

BUFFERS & POLISHERS
Black & Decker Mfg. Co., Towson, Md.
Blount Co., J. G., Everett, Mass.
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Continental Machines, Inc., Minneapolis
Delta Mfg. Co., Milwaukee
Dumore Co., Racine, Wis.
Gardner Machine Co., Beloit, Wis.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Haskins Co., R. G., Chicago
Heald Machine Co., Worcester, Mass.
Hill-Acme Co., Cleveland
Jefferson Mach. Tool Co., Cincinnati
Landis Tool Co., Waynesboro, Pa.
Mattison Machine Works, Rockford, Ill.
New Britain-Gridley Mach. Co., New Britain, Conn.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Rotor Tool Co., Cleveland
Schauer Machine Co., Cincinnati
Stow Mfg. Co., Binghamton, N. Y.
Strand & Co., N. A., Chicago
Union Twist Drill Co., Athol, Mass.
Vonnegut Moulder Corp., Indianapolis
Walker-Turner Co., Plainfield, N. J.

BUFFERS & POLISHERS, Hand
Behr-Manning Corp., Troy, N. Y.
Roberts Rubber Co., Weldon, Newark, N. J.

BULLDOZERS
Baldwin-Southwark Corp., Philadelphia
Beatty Mach. & Mfg. Co., Hammond, Ind.
Elmes Eng. Works, Chas. F., Chicago
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Watson-Stillman Co., Roselle, N. J.

BURNERS, Gas & Oil Furnace
American Gas Furn. Co., Elizabeth, N. J.
Hones, Inc., Charles A., Baldwin, N. Y.
Strong, Carlisle & Hammond Co., Cleveland
Surface Combustion Corp., Toledo, O.

BURNISHERS, Gear
Colonial Broach Co., Detroit
Detroit Tap & Tool Co., Detroit
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
Michigan Tool Co., Detroit
National Broach & Machine Co., Detroit
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

BURNISHING MACHINES
Consolidated Machine Tool Corp., Rochester, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Michigan Tool Co., Detroit
Sheffield Corp., Dayton, O.

BURRING MACHINES
Consolidated Mach. Tool Corp., Rochester, N. Y.
Cross Gear & Machine Co., Detroit
Hill Acme Co., Cleveland
National Broach & Machine Co., Detroit
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.

BUSHINGS, Drill
Carboloy Co., Detroit
Colonial Broach Co., Detroit
Detroit Tap & Tool Co., Detroit
Ex-Cell-O Corp., Detroit
Metal Carbides Corp., Youngstown, O.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS Steel (See LOCKERS & SHELVING)

CALIPERS & COMPASSES
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Farrel-Birmingham Co., Ansonia, Conn.
Lufkin Rule Co., Saginaw, Mich.
Randall & Stickney, Waltham, Mass.
Scherr Co., Geo., N. Y. C.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.

CAMS, Machine
Brown & Sharpe Mfg. Co., Providence, R. I.
Cross Gear & Machine Co., Detroit
Hartford Special Machinery Co., Hartford, Conn.
Weldon Tool Co., Cleveland

CARBURIZERS (See also BOXES, Heat-Treating & Annealing)
American Gas Furn. Co., Elizabeth, N. J.
Houghton & Co., E. F., Philadelphia
Surface Combustion Corp., Toledo, O.

CARTRIDGE-CASE FINISHING MACHINES
Coulter Mach. Co., Jas., Bridgeport, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

CASTINGS
American Brake Shoe & Fdry. Co., N. Y. C.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bunting Brass & Bronze Co., Toledo
Etna Machine Co., Toledo, O.
Hill Acme Co., Cleveland
Jefferson Mach. Tool Co., Cincinnati
Johnson Bronze Co., New Castle, Pa.
Mattison Machine Wks., Rockford, Ill.
Springfield Mach. Tool Co., Springfield, O.

CEMENT, Belt
Desmond-Stephan Mfg. Co., Urbana, O.
Dixon Crucible Co., Jos., Jersey City, N. J.
Houghton & Co., E. F., Philadelphia
Rhoads & Sons, J. E., Philadelphia

CEMENT, Refractory
Carborundum Co., Niagara Falls, N. Y.
Norton Company, Worcester, Mass.

CENTERING MACHINES
Consolidated Mach. Tool Corp., Rochester, N. Y.
Hanson-Whitney Machine Co., Hartford, Conn.
Hendey Machine Co., Torrington, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Seneca Falls Mach. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., Detroit
Sundstrand Mach. Co., Rockford, Ill.

CENTERS, Bench
Brown & Sharpe Mfg. Co., Providence, R. I.
Dearborn Gage Co., Dearborn, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Starrett Co., L. S., Providence, R. I.

CENTERS, Machine
Abrasive Mach. Tool Co., E. Providence, R. I.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Company, Bridgeport, Conn.
Carboloy Co., Detroit
Cincinnati Lathe & Tool Co., Cincinnati
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Hendey Machine Co., Torrington, Conn.
Ideal Commutator Dresser Co., Chicago
Knight Machinery Co., W. B., St. Louis
McKenna Metals Co., Latrobe, Pa.
Metal Carbides Corp., Youngstown, O.
Michigan Tool Co., Detroit
Morse Tool Co., Detroit

WHERE-TO-BUY DIRECTORY

Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Ready Tool Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Stevens Inc., John B., N. Y. C.
Sturdimatic Tool Co., Detroit
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vascoloy-Ramet Corp., N. Chicago, Ill.
Warner & Swasey Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.

CENTRIFUGALS (See PURIFIERS, Oil & Coolant)

CENTRIFUGAL MACHINERY
Barrett Co., Leon J., Worcester, Mass.
DeLaval Separator Co., N. Y. C.
Sparkler Mfg. Co., Mundelein, Ill.

CHAIN, Forged-Steel Link
American Chain & Cable Co., Bridgeport, Conn.
Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
McKay Co., Pittsburgh
Scully Steel Products Co., Chicago

CHAINS, Conveyor
Allis-Chalmers Mfg. Co., Milwaukee
American Chain & Cable Co., Bridgeport, Conn.

CHAINS, Transmission
Bilgram Gear & Mach. Wks., Philadelphia
Cincinnati Gear Co., Cincinnati
Morse Chain Co., Ithaca, N. Y.
Ohio Gear Co., Cleveland

CHAMFERING MACHINES
Bilgram Gear & Mach. Wks., Philadelphia
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Gear & Machine Co., Detroit
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Lipe-Rollway Corp., Syracuse, N. Y.
Murchey Machine & Tool Co., Detroit
National Broach & Mach. Co., Detroit
Sheffield Corp., Dayton, O.

CHECKS, Metal, Time and Tool
Acromark Co., Elizabeth, N. J.
Noble & Westbrook Mfg. Co., East Hartford, Conn.
Revere Copper & Brass Inc., N. Y. C.

CHISELS, Hand (See TOOLS, Hand)

CHISELS, Chipping, Pneumatic & Electric Hammer
Bethlehem Steel Co., Bethlehem, Pa.
Black & Decker Mfg. Co., Towson, Md.
Cleveland Pneumatic Tool Co., Cleveland
Plomb Tool Co., Los Angeles, Calif.
Scully-Jones & Co., Chicago

CHUCKING MACHINES (See also LATHES, Automatic & Semi-Automatic)
Bullard Co., Bridgeport, Conn.
Cincinnati Lathe & Tool Co., Cincinnati
Cleveland Automatic Mach. Co., Cleveland
Cone Automatic Mach. Co., Windsor, Vt.
Foote-Burt Co., Cleveland
Gisholt Machine Co., Madison, Wis.
Gorton, Mach. Co., George, Racine, Wis.
Goss & deLeeuw Mach. Co., New Britain, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Lees-Bradner Co., Cleveland
National Acme Co., Cleveland
New Britain-Gridley Mach. Div., New Britain, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.
Warner & Swasey Co., Cleveland
Wickman Corp., Detroit

CHUCKS, Air (See CHUCKS, Pneumatic)

CHUCKS, Collet (See Collets)

CHUCKS, Drill & Tap
Atlas Press Co., Kalamazoo, Mich.
Errington Mech. Lab., Stapleton, N. Y.
Etteo Tool Co., Brooklyn, N. Y.
Gisholt Machine Co., Madison, Wis.
Horton & Son Co., E., Windsor Locks, Conn.
Jacobs Mfg. Co., Hartford, Conn.
McCrosky Tool Corp., Meadville, Pa.
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
North Bros., Mfg. Co., Philadelphia
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland

CHUCKS, Drill, Quick-Change, Collet
Errington Mech. Lab., Stapleton, N. Y.
Gairing Tool Co., Detroit
Modern Tool Works, Rochester, N. Y.
Scully-Jones & Co., Chicago

CHUCKS, Gear
Cushman Chuck Co., Hartford, Conn.
Gleason Works, Rochester, N. Y.
Sheffield Corp., Dayton, O.

CHUCKS, Hydraulic
Cross Gear & Machine Co., Detroit
Cushman Chuck Co., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
New Britain-Gridley Machine Div., New Britain, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.
Tomkins-Johnson Co., Jackson, Mich.
Warner & Swasey Co., Cleveland

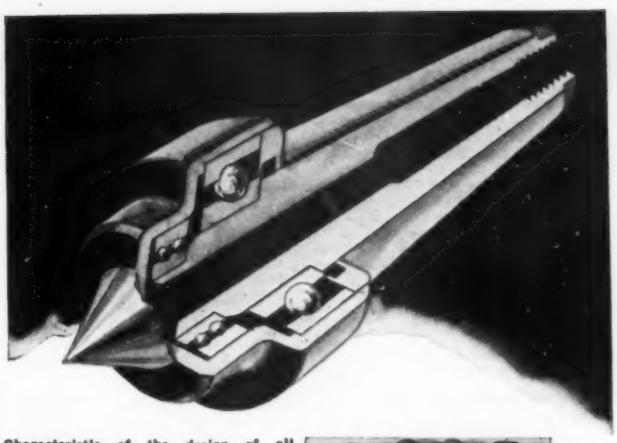
CHUCKS, Lathe
Atlas Press Co., Kalamazoo, Mich.
Cincinnati Lathe & Tool Co., Cincinnati
Cushman Chuck Co., Hartford, Conn.
Delta Mfg. Co., Milwaukee
Gisholt Machine Co., Madison, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
Harnischfeger Corp., Milwaukee
Hendey Machine Co., Torrington, Conn.
Horton & Son Co., E., Windsor Locks, Conn.
L-W Chuck Co., Toledo, O.
McCrosky Tool Corp., Meadville, Pa.
Potter & Johnston Machine Co., Pawtucket, R. I.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rivett Lathe & Grinder, Inc., Boston
Scherr Co., Geo., N. Y. C.
Tomkins-Johnson Co., Jackson, Mich.

CHUCKS, Magnetic
Abrasive Mach. Tool Co., E. Providence, R. I.
Arter Grinding Mach. Co., Worcester, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Heald Machine Co., Worcester, Mass.
L-W Chuck Co., Toledo, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.

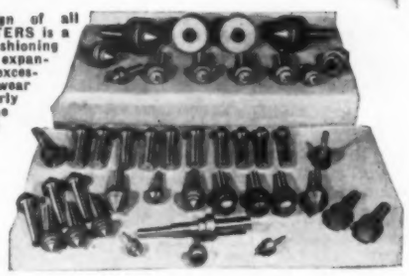
CHUCKS, Motorized Electric
Cushman Chuck Co., Hartford, Conn.
Goss & deLeeuw Machine Co., New Britain, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.
Warner & Swasey Co., Cleveland

CHUCKS, Pneumatic
Cushman Chuck Co., Hartford, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.
Tomkins-Johnson Co., Jackson, Mich.
Warner & Swasey Co., Cleveland

CHUCKS, Ring-Wheel
Abrasive Mach. Tool Co., E. Providence, R. I.
Bridgeport Safety Emery Wheel Co., Inc., Bridgeport, Conn.
Gardner Machine Co., Beloit, Wis.



Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum . . . A Properly engineered Live Center is one of the fundamentals of setting up a job and requires a specialists experience . . . standard shanks with Morse taper carried in stock . . . We will see that your job is set up with the right Live Center — Prompt deliveries on high priorities.



STURDIMATIC
TOOL COMPANY
5214 THIRD AVE. DETROIT, MICH.

BALANCED
GRINDER DOGS
for
CYLINDRICAL GRINDERS
Easily Adjusted

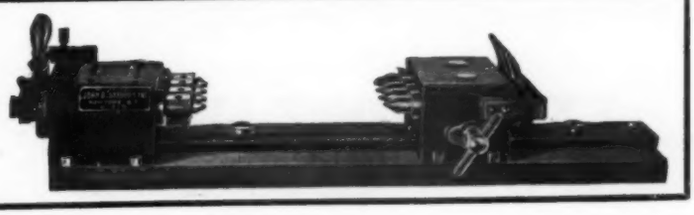
Each dog covers work of a number of different diameters. Four sizes accommodating any diameter from 1/4" to 6". Provided with brass faces and brass tipped set screws.

THE READY TOOL COMPANY
IRANISTAN & R.R. AVES., BRIDGEPORT, CONN.

BAUMBACH
STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST
46 Styles—195,000 Sizes
E. A. BAUMBACH MFG. CO.
Machined Steel Drop Forged Steel Semi-Steel
Send for our new catalog
1812 South Kilbourn Ave., Chicago, Ill.

THIRTY YEARS EXPERIENCE MANUFACTURING
MULTIPLE SPINDLE INDEX CENTERS
Three and four spindles of various types and sizes. *Write for circular.*
JOHN B. STEVENS INC. • 474 Canal St., New York, N. Y.



WHERE-TO-BUY DIRECTORY

CHUCKS, Spring
Brown & Sharpe Mfg. Co., Providence, R. I.
Harnischfeger Corp., Milwaukee
Rivett Lathe & Grinder, Inc., Boston

CLAMPS, Machinist's
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
North Bros. Mfg. Co., Philadelphia
Williams & Co., J. H., Buffalo, N. Y.

CLEANERS, Industrial, Vacuum
Ideal Commutator Dresser Co., Chicago

CLEANERS, Metal (See COMPOUNDS, Cleaning)

CLEANING EQUIPMENT (See METAL-CLEANING EQUIPMENT)

CLOTH, Abrasive (See PAPER & CLOTH, Abrasive)

CLUTCHES, Friction
Allis-Chalmers Mfg. Co., Milwaukee
Carlyle Johnson Machine Co., Manchester, Conn.
Dodge Mfg. Corp., Mishawaka, Ind.
Errington Mech. Lab., Stapleton, N. Y.
Foote Bros. Gear & Machine Co., Chicago
Hill Acme Co., Cleveland, O.
Lipe-Rollway Corp., Syracuse, N. Y.
Morse Chain Co., Ithaca, N. Y.
Reeves Pulley Co., Indianapolis

COLLARS, Safety
American Pulley Co., Philadelphia
Carlyle Johnson Machine Co., Manchester, Conn.
Dodge Mfg. Corp., Mishawaka, Ind.
Standard Pressed Steel Co., Jenkintown, Pa.

COLLARS, Spacing
Atkins & Co., E. C., Indianapolis
Hill Acme Co., Cleveland
Morse Twist Drill & Machine Co., New Bedford, Mass.
Scully-Jones & Co., Chicago
Standard Pressed Steel Co., Jenkintown, Pa.

COLLECTORS, Dust
Blake Co., Edward, Newton Centre, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Covel Mfg. Co., Benton Harbor, Mich.
Torit Mfg. Co., St. Paul, Minn.

COLLETS
Atlas Press Co., Kalamazoo, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Lathe & Tool Co., Cincinnati
Cincinnati Milling Mach. Co., Cincinnati
Cleveland Automatic Mach. Co., Cleveland
Cone Automatic Mach. Co., Windsor, Vt.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cushman Chuck Co., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Brothers, Inc., Elmira, N. Y.
Hendey Machine Co., Torrington, Conn.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland
National Auto, Tool Co., Richmond, Ind.
National Twist Drill & Mach. Co., Detroit
New Britain-Gridley Machine Co., New Britain, Conn.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Reed Prentice Co., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Stark Tool Co., Waltham, Mass.
Sundstrand Mach. Tool Co., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth, Mich.
Van Norman Mach. Tool Co., Springfield, Mass.
Warner & Swasey Co., Cleveland

EXECUTONE
Communication Systems
for amplified paging and private 2-way conversations

Switchboard bottle-necks slow up your entire organization; interior calls cause congestion; waiting for connections wastes valuable time. With EXECUTONE, you can talk directly to, and receive information from, anyone in any part of your plant, instantly, without taking him from his work. This saves your time and the time of your employees — steps up efficiency — keeps production at full speed 60 seconds every minute.

EXECUTONE quickly pays for itself in man-hours saved.

Write for descriptive folder F 1

EXECUTONE, Inc.
415 Lexington Avenue, New York, N. Y.

SERVICE FACILITIES IN PRINCIPAL CITIES

COMMUNICATION SYSTEMS
Executone, Inc., N. Y. C.

COMPARATORS, Dial
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp, Dayton, O.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vard, Inc., Pasadena, Calif.

COMPARATORS, Disc.
American Measuring Instrument Co., N. Y. C.

COMPARATORS, Gear-Tooth & Screw-Thread
Farrel-Birmingham Co., Buffalo, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Starrett Co., L. S., Athol, Mass.

COMPARATORS, Optical
Jones & Lamson Mach. Co., Springfield, Vt.
Scherr Co., Inc., Geo., N. Y. C.
Vard, Inc, Pasadena, Calif.

COMPASSES, Metal-Scribing (See CALIPERS & COMPASSES)

COMPOUNDS, Cleaning
Bullard Co., Bridgeport, Conn.
Detroit Rex Products Co., Detroit
Houghton & Co., E. F., Philadelphia
Magnus Chemical Co., Garwood, N. J.
Oakite Products, N. Y. C.
Turco Products, Inc., Los Angeles

COMPOUNDS, Drawing, Metal & Wire
Houghton & Co., E. F. Philadelphia
Shell Oil Co., Inc., N. Y. C.

COMPOUNDS, Grinding & Polishing
Carborundum Co., Niagara Falls, N. Y.
National Broach & Machine Co., Detroit
Norton Co., Worcester, Mass.

COMPOUNDS, Lubricating
Acheson Colloids Corp., Port Huron, Mich.

COMPOUNDS, Plastic Molding
Bakelite Corp., N. Y. C.
Dow Chemical Co., Midland, Mich.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

COMPOUNDS, Tempering & Case-Hardening
Houghton & Co., E. F., Philadelphia
Oakite Products, Inc., N. Y. C.
Strong, Carlisle & Hammond Co., Cleveland
Stuart Oil Co., D. A., Chicago

COMPRESSORS, Air & Gas
Allis-Chalmers Mfg. Co., Milwaukee
American Gas Furn Co., Elizabeth, N. J.
Curtis Pneumatic Machry. Co., St. Louis
General Electric Co., Schenectady, N. Y.
Wright Mfg. Div. of Amer. Chain & Cable Co., York, Pa.

CONSULTANTS
Trundle Engrg. Co., Cleveland

CONTOUR MACHINES
Continental Machines, Inc., Minneapolis
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

CONTRACT WORK (See also Index, last page)
Aluminum Co. of America, Pittsburgh
American Cutter & Engrg. Corp., Warren, Mich.
Baldwin Southwark Corp., Philadelphia
Bayard & Co., M. L., Philadelphia
Chapman-Valve Mfg. Co., Boston (Heat Treating)
Continental Can Co., Inc., N. Y. C.
Eastern Machine Screw Corp., New Haven, Conn.
Elmes Engrg. Wks., Chas. F., Chicago
Ericson Screw Machine Prod. Inc., Brooklyn, N. Y.
Excello Corp., Detroit (Heat Treating)
Fenn Mfg. Co., Hartford, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Hartford Special Machy. Co., Hartford, Conn.
Jefferson Mach. Tool Co., Cincinnati, O.
Carlyle Johnson Machine Co., Manchester, Conn.
Kent-Owens Machine Co., Toledo, O.
Kropp Forge Co., Chicago, (Forgings)
Liberty Tool & Gage Wks., Providence, R. I. (Jigs & Fixtures)
Meisel Press Mfg. Co., Boston
National Acme Co., Cleveland
National Twist Drill & Tool Co., Detroit
New Britain-Gridley Machine Co., New Britain Conn. (Screw Machine Products)
Revere Copper & Brass, Inc., N. Y. C. (Forgings)
Rhode Island Tool Co., Providence, R. I. (Drop Forgings; Heat Treating; Screw Machine Products)
Stewart Iron Wks. Co., Inc., Cincinnati
Surface Combustion Corp., Toledo, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vard, Inc., Pasadena, Calif.
Watson-Stillman Co., Roselle, N. J.
Williams & Co., J. H., Buffalo, N. Y.
Woodworth Co., N. A., Ferndale, Mich.

CONTROLLERS, Motor
Allen-Bradley Co., Milwaukee
Allis-Chalmers Mfg. Co., Milwaukee
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland
Square D Co., Milwaukee
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

CONTROLLERS, Pressure & Temperature
American Gas Furn. Co., Elizabeth, N. J.
Brown Instrument Co., Philadelphia

CONTROLS, Flexible-Shaft (See SHAFTS, Flexible)

CONTROLS, Furnace
American Gas Furn. Co., Elizabeth, N. J.
Brown Instrument Co., Philadelphia
Strong, Carlisle & Hammond Mach. Co., Cleveland

CONTROLS, Hydraulic
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Sundstrand Mach. Tool Co., Rockford, Ill.
Vickers, Inc., Detroit
Watson-Stillman Co., Roselle, N. J.

CONVEYORS
Allis-Chalmers Mfg. Co., Milwaukee
Mathews Conveyor Co., Ellwood City, Pa.
Standard Conveyor Co., N. St. Paul, Minn.

COOLANT SYSTEMS, Portable
Gray Mills Co., Chicago

COOLANTS, Cutting, Drilling & Grinding
Carborundum Co., Niagara Falls, N. Y.
Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia
Oakite Products, Inc., N. Y. C.
Shell Oil Co., Inc., N. Y. C.
Socony Vacuum Oil Co., Inc., N. Y. C.
Standard Oil Co. of Ind., Chicago
Stuart Oil Co., Ltd., D. A., Chicago
Sun Oil Co., Philadelphia
Swan-Finch Oil Corp., N. Y. C.
Tidewater Associated Oil Co., N. Y. C.

COUNTERBORES
Barnes Drill Co., Rockford, Ill.
Butterfield & Co., Derby Line, Vt.
Carbide Tool Co., Chicago
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Genesee Tool Co., Detroit
Haynes Stellite Co., N. Y. C.
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Vascoloy-Ramet Corp., N. Chicago, Ill.
Weldon Tool Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.

COUNTERSHAFTS
American Tool Works Co., Cincinnati
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Lathe & Tool Co., Cincinnati
Dodge Mfg. Corp., Mishawaka, Ind.
Earle Gear & Mach. Co., Philadelphia
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.
Hill Acme Co., Cleveland
LeBlond Mach. Tool Co., R. K., Cincinnati

WHERE-TO-BUY DIRECTORY

Rivett Lathe & Grinder, Inc., Boston
Stow Mfg. Co., Binghamton, N. Y.
Warner & Swasey Co., Cleveland

COUNTERSINKS (See DRILLS, Twist)

COUNTERS, Revolution & Stroke
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.

COUPLINGS, Hose
Cleveland Pneu. Tool Co., Cleveland
Schrader's Son, A., Brooklyn, N. Y.

COUPLINGS, Shaft, Flexible
Allis-Chalmers Mfg. Co., Milwaukee
Delta Mfg. Co., Milwaukee
Earle Gear & Mach Co., Philadelphia
Farrel-Birmingham Co., Buffalo, N, Y.
Foote Bros. Gear & Mach. Co., Chicago
Hill Acme Co., Cleveland
Morse Chain Co., Ithaca, N. Y.
Nicholson & Co., W. H., Wilkes-Barre, Pa.

COUPLINGS, Shaft, Non-Flexible
Dodge Mfg. Corp., Mishawaka, Ind.
General Electric Co., Schenectady, N. Y.
Hill Acme Co., Cleveland
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Jib
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis Pneumatic Machy. Co., St. Louis
Harnischfeger Corp., Milwaukee
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CRANES, Portable
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CRANES, Overhead Traveling
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis Pneumatic Machry. Co., St. Louis
Harnischfeger Corp., Milwaukee
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CUPS, Oil & Grease
Gits Bros. Mfg. Co., Chicago

CUSHIONS, Die
V. & O. Press Co., Hudson, N. Y.

CUTTERS, Angle
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Detroit
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
McCrosky Tool Co., Meadville, Pa.
McKenna Metals Co., Latrobe, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago

CUTTERS, Die-Sinking
Detroit Tap & Tool Co., Detroit
Gairing Tool Co., Detroit
Gorton Machine Co., Geo., Racine, Wis.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.

CUTTERS, Formed
Atkins & Co., E. C. Indianapolis
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Co., Detroit
Cleveland Twist Drill Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Detroit Tap & Tool Co., Detroit
Disston & Sons, Inc., Henry, Philadelphia
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Weldon Tool Co., Cleveland

CUTTERS, Gear
Adams Co., Dubuque, Iowa
Bantam Bearings Corp., S. Bend, Ind.
Barber-Colman Co., Rockford, Ill.
Bilgram Gear & Mach. Wks., Philadelphia
Brown & Sharpe Mfg. Co., Providence, R. I.
Carbide Tool Co., Chicago.
Cleveland Hobbing Mach. Co., Cleveland
Cross Gear & Machine Co., Detroit
Farrel-Birmingham Co., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
Illinois Tool Works, Chicago
Lees-Bradner Co., Cleveland
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Broach & Mach. Co., Detroit
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Scherr Co., Geo., N. Y. C.
Standard Tool Co., Cleveland
Stow Mfg. Co., Binghamton, N. Y.
Taylor Machine Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Waltham Mach. Wks., Waltham, Mass.

CUTTERS, Hand Pipe (See STOCKS, DIES & CUTTERS, Pipe)

CUTTERS, Keyseater
Baker Bros., Inc., Toledo, O.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Colonial Broach Co., Detroit
Davis Keyseater Co., Rochester, N. Y.
Ex-Cell-O Corp., Detroit
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Mitts & Merrill, Saginaw, Mich.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Broach & Mach. Co., Detroit
National Machine Tool Co., Cincinnati
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co. Hartford, Conn.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

CUTTERS, Milling
Atlas Press Co., Kalamazoo, Mich.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carbide Tool Co., Chicago.
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Crafts Co., Inc., Arthur A., Boston
Detroit Tap & Tool Co., Detroit
Disston & Sons, Inc., Henry, Philadelphia
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Genesee Tool Co., Detroit
Gorton Mach. Co., George, Racine, Wis.
Grayson Mfg. Co., Monrovia, Calif.
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Kearney & Trgacker Corp., Milwaukee
Lovejoy Tool Co., Inc., Springfield, Vt.
McCrosky Tool Corp., Meadville, Pa.
McKenna Metals Co., Latrobe, Pa.
Michigan Tool Co., Detroit
Modern Tool Works, Rochester, N. Y.
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
O. K. Tool Co., Shelton, Conn.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Vascoloy-Ramet Corp., N. Chicago, Ill.
Waltham Mach. Wks., Waltham, Mass.
Weldon Tool Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.
Williams & Co., J. H. Buffalo, N. Y.

CUTTERS, Wire
Ideal Commutator Dresser Co., Chicago

CUTTING-OFF MACHINES (See SAWS)

CUTTING-OFF MACHINES, Abrasive-Wheel
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Campbell Div., Andrew C., American Chain & Cable Co., Bridgeport, Conn.
deSanno & Sons, Inc., A. P., Philadelphia
Porter McLeod Machine Tool Co., Inc., Hatfield, Mass.
Racine Tool & Mach. Co., Racine, Wis.

CYLINDERS, Air (See TANKS & CYLINDERS, Air)

CYLINDERS, Hydraulic (See PRESSES, Hydraulic)

DEALERS, Machinery (See Searchlight Section)

DEGREASERS (See Metal Cleaning Equipment)

DEMAGNETIZERS
Abrasive Machine Tool Co., E. Providence, R. I.

BRIDGEPORT "ABRASAW"

Wet Cut-Off Machines are MODERN and MONEY SAVING

They do a Real Job. Ample power. Good clean cut, without heating the metal. Two sizes, for solids up to 2½" and tubing up to 3½".

• *Send for Descriptive Circulars*

BRIDGEPORT
Safety Emery Wheel Co., Inc.
1286 W. BROAD ST.
BRIDGEPORT CONN.

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters *and saves time and money*

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

AUTOMATIC
DIE HEAD
for USE on
TURRET OR HAND
SCREW MACHINES

RICKERT
SHAFER
Specialists
IN
THREADING
TOOLS

AUTOMATIC DIE HEADS
COLLAPSIBLE TAPS
BORING HEADS
FRICTION TAPPERS
SPECIAL THREADING MACHINES

The RICKERT-SHAFER Co.
ERIE, PA.

GAGES
CRAFTS

Carbide and Diamond-tipped
GAGES AND TOOLS
GUARANTEED QUALITY
ARTHUR A. *Crafts* COMPANY, INC.
Chicago 532 COMMONWEALTH AVE. *Detroit*
Boston

DIES *TAPS*
Right from the Lead
THE GEOMETRIC TOOL CO.
NEW HAVEN, CONN.

LELAND-GIFFORD COMPANY · WORCESTER MASS. U.S.A. · MACHINE BOOKS · CRANK SHAFTS
Drilling and Tapping Machines
(Automatic and Semi-Automatic)
LELAND GIFFORD Co.
WORCESTER, MASS.

WHERE-TO-BUY DIRECTORY

Blanchard Mach. Co., Cambridge, Mass.
L-W Chuck Co., Toledo, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.

DIAMONDS, Industrial
Carboloy Co., Inc., Detroit
Crafts Co., Inc., Arthur A., Boston
Desmond-Stephan Mfg. Co., Urbana, O.
Diamond Tool Co., Chicago
Koebel Diamond Tool Co., Detroit
Smit & Sons, Inc., J. K., N. Y. C.

DIE-CASTING MACHINES
Continental Machines, Inc., Minneapolis
Reed-Prentice Corp., Worcester, Mass.

DIE-HEADS, Threading
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Chaso Tool Co., Royal Oak, Mich.
Eastern Machine Screw Corp., New Haven, Conn.
Errington Mech. Lab., Stapleton, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap and Die Corp., Greenfield, Mass.
Hill Acme Co., Cleveland
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit
National Acme Co., Cleveland
Oster Mfg. Co., Cleveland
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Warner & Swasey Co., Cleveland
Winter Brothers Co., Wrentham, Mass.

DIE-MAKERS' SUPPLIES
Baumbach Mfg. Co., E. A., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Co., Inc., Detroit
Danly Mach. Specialists, Inc., Chicago
Dykem Co., St., Louis
Lufkin Rule Co., Saginaw, Mich.
Producto Mach. Co., Bridgeport, Conn.
Starrett Co., L. S., Athol, Mass.

DIE-MAKING & CUTTING MACHINES
Cincinnati Milling Mach. Co., Cincinnati
Continental Machines, Inc., Minneapolis
Gorton Machine Co., Geo., Racine, Wis.
Henry & Wright Mfg. Co., Hartford, Conn.
Illinois Tool Works, Chicago
Johnson Tool Co., E. Providence, R. I.
Peerless Machine Co., Racine, Wis.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Reed-Prentice Co., Worcester, Mass.

DIE-SETS
Baumbach Mfg. Co., E. A., Chicago
Card Mfg. Co., S. W., Mansfield, Mass.
Danly Mach. Specialties, Inc., Chicago
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

DIE-SINKING MACHINES
Cincinnati Milling Mach. Co., Cincinnati
Gorton Machine Co., Geo., Racine, Wis.
Pratt & Whitney Div. Niles-Beamont-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Reed-Prentice Corp., Worcester, Mass.

DIES, Marking & Embossing
Acromark Co., Elizabeth, N. J.
Matthews & Co., Jas. H., Pittsburgh
Noble & Westbrook Mfg. Co., East Hartford, Conn.

DIES, Screw-Cutting, Adjustable
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Eastern Machine Screw Corp., New Haven, Conn.
Errington Mech. Lab., Stapleton, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit
National Acme Co., Cleveland
Rickert-Shafer Co., Erie, Pa.
Standard Tool Co., Cleveland
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Brothers Co., Wrentham, Mass.

DIES, Sheet-Metal & Forging
Hamilton Tool Co., Hamilton, O.
Scully-Jones & Co., Chicago
Taft-Peirce Mfg. Co., Woonsocket, R. I.

DIES, Solid Bolt & Pipe
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Consolidated Machine Tool Corp., Rochester, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Oster Mfg. Co., Cleveland
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Warner & Swasey Co., Cleveland

DIES, Sub-Press
Baumbach Mfg. Co., E. A., Chicago
Danly Mach. Specialties, Inc., Chicago
Producto Machine Co., Bridgeport, Conn.
V & O Press Co., Hudson, N. Y.
Waltham Mach. Works, Waltham, Mass.

DIES, Wire-Drawing & Extrusion
Carboloy Co., Inc., Detroit
Crafts Co., Arthur A., Boston
Firth-Sterling Steel Co., McKeesport, Pa.
Illinois Tool Works, Chicago
Metal Carbides Corp., Youngstown, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vascoloy-Ramet Corp., N. Chicago, Ill.

DISKS, Abrasive (See **WHEELS, Grinding & Polishing**)

DISKS, Circular Cutting
Atkins & Co., E. C., Indianapolis
Disston & Sons, Inc., Henry, Philadelphia
Morse Twist Drill and Machine Co., New Bedford, Mass.

DIVIDERS (See **CALIPERS & COMPASSES**)

DOGS, Lathe & Milling-Machine
Armstrong Bros. Tool Co., Chicago
Atlas Press Co., Kalamazoo, Mich.
Cincinnati Lathe & Tool Co., Cincinnati
Hendey Machine Co., Torrington, Conn.
LeBlond Mach. Tool Co., R. K., Cincinnati
Ready Tool Co., Bridgeport, Conn.
Sturdimatic Tool Co., Detroit
Williams & Co., J. H., Buffalo, N. Y.

DRESSERS, Grinding Wheel
American Swiss File & Tool Co., Elizabeth, N. J.
Atkins & Co., E. C., Indianapolis
Black & Decker Mfg. Co., Towson, Md.
Carboloy Co., Inc., Detroit
Carborundum Co., Niagara Falls, N. Y.
Chicago Wheel & Mfg. Co., Chicago
Crafts Co., Inc., Arthur A., Boston.
Desmond-Stephan Mfg. Co., Urbana, O.
Disston & Sons, Inc., Henry, Philadelphia
Dumore Co., Racine, Wis.
Ideal Commutator Dresser Co., Chicago
Metal Carbides Corp., Youngstown, O.
Smit & Sons, J. K., N. Y. C.
Standard Tool Co., Cleveland
Victor Machinery Exchange, N. Y. C.

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin —also circulars on Drill pointers, Point Thinners, Mill cutter Grinders and Tap Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

WHERE-TO-BUY DIRECTORY

DRESSERS, Radius & Angle
Auto Ordnance Corp., Bridgeport, Conn.
I & S Tool Co., E. Orange, N. J.
Norton Co., Worcester, Mass.
Schultz & Anderson Co., Newark, N. J.

DRESSING, Belt
Houghton & Co., E. F., Philadelphia
Rhoads & Sons, J. E., Philadelphia
Tide Water Associated Oil Co., N. Y. C.
White & Bagley, Worcester, Mass.

DRIERS, Centrifugal
Barrett Co., Leon J., Worcester, Mass.
DeLaval Separator Co., N. Y. C.

DRIFTS, Drill
Armstrong Bros. Tool Co., Chicago
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill & Machine Co., New Bedford, Mass.
Standard Tool Co., Cleveland

DRILLROD, Steel Tool (See STEEL, Tool)

DRILLS, Automatic & Semi-Automatic
Avey Drilling Machine Co., Cincinnati
Baker Bros., Toledo, O.
Barnes Co., W. F., & John, Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Bodine Corp., Bridgeport, Conn.
Bradford Machine Tool Co., Cincinnati
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati Gilbert Machine Tool Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Cross Gear and Machine Co., Detroit
Davis & Thompson Co., Milwaukee
Ex-Cell-O Corp., Detroit
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Goss & deLeeuw Machine Co., New Britain, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Auto Tool Co., Richmond, Ind.
North Bros. Mfg. Co., Philadelphia
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Snyder Tool & Engrg. Co., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.

DRILLS, Bench
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Barnes Co., W. F. & John, Rockford, Ill.
Black & Decker Mfg. Co., Towson, Md.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Delta Mfg. Co., Milwaukee
Dumore Co., Racine, Wis.
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Hamilton Tool Co., Hamilton, O.
Henry & Wright Mfg. Co., Hartford, Conn.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
North Bros. Mfg. Co., Philadelphia
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Ryerson & Son, Jos. T., Chicago
Schauer Mach. Co., Cincinnati
Skilsaw, Inc., Chicago
Walker-Turner Co., Plainfield, N. J.

DRILLS, Breast (See TOOLS, Hand)

DRILLS, Center
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill and Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Div. Niles-Bement-Pond Co., Hartford, Conn.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Victor Machinery Exchange, N. Y. C.

DRILLS, Column-Type
Atlas Press Co., Kalamazoo, Mich.
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., Rockford, Ill.
Barnes Co., W. F. & John, Rockford, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati Gilbert Machine Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
Dalzen Tool & Mfg. Co., Detroit
Davis & Thompson Co., Milwaukee
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
General Machy. Corp., Hamilton, O.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Auto. Tool Co., Richmond, Ind.
Snyder Tool & Engrg. Co., Detroit

DRILLS, Core
Carboloy Co., Inc., Detroit
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Haynes Stellite Co., N. Y. C.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Wendt Sonis Co., Hannibal, Mo.

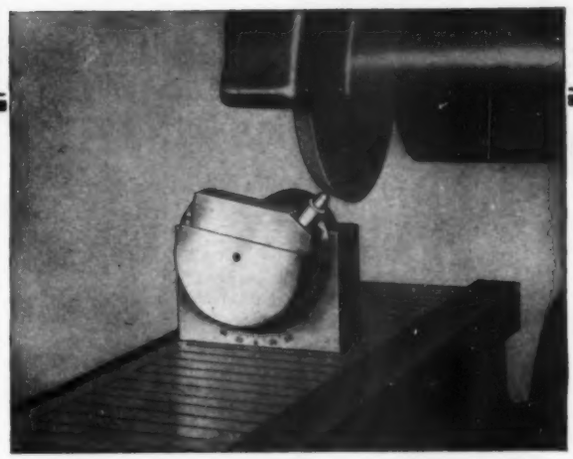
DRILLS, Flat (See DRILLS, Twist & Flat)

DRILLS, Hand (See Tools, Hand)

DRILLS, Horizontal
Avey Drilling Machine Co., Cincinnati
Baker Bros. Inc., Toledo, Ohio
Barnes Co., W. F. & John, Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass.
Bradford Machine Tool Co., Cincinnati
Buhr Mach. Tool Co., Ann Arbor, Mich.
Cincinnati Gilbert Machine Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Giddings & Lewis Mach. Tool Co., Fond du Lac, Wis.
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
Murchey Machine and Tool Co., Detroit
National Auto. Tool Co., Richmond, Ind.
Ryerson & Son, Jos. T., Chicago
Sellers & Co., Inc., Wm., Philadelphia
Snyder Tool & Engrg Co., Detroit
Universal Boring Mach. Co., Hudson, Mass.

DRILLS, Deep-Hole
Barnes Co., W. F. & John, Rockford, Ill.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

DRILLS, Multi-Spindle or Gang
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Baker Bros. Inc., Toledo, O.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass
Bodine Corp., Bridgeport, Conn.
Bradford Machine Tool Co., Cincinnati
Buffalo Forge Co., Buffalo, N. Y.
Buhr Mach. Tool Co., Ann Arbor, Mich.
Bullard Co., Bridgeport, Conn.
Cincinnati Bickford Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., Milwaukee
Delta Mfg. Co., Milwaukee
Ex-Cell-A Corp., Detroit
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Henry & Wright Mfg. Co., Hartford, Conn.
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Auto. Tool Co., Richmond, Ind.



QUICK ANGLE DRESSER

THE Welch Quick Angle Dresser can be set quickly for dressing the grinding wheel to any desired angle. It is compact, durable; simple in construction. All surfaces are hardened and ground. Furnished in plain or Vernier type. Plain dresser graduated in degrees. . . . Vernier reads in degrees and minutes. The Vernier being an integral part of the base block eliminates any possibility of error. 10 DAYS FREE TRIAL IF DESIRED.

Write for particulars

Plain Type, $70 Net

●

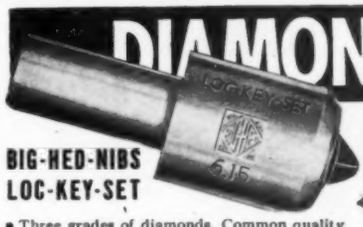
Vernier Type, $82.50 Net

Welch INDUSTRIES INCORPORATED

Makers of High Speed Milling Cutters . . . Form Tools and Special Tools

20,000 West Eight-Mile Road. Detroit, Michigan

DIAMONDS for Victory



BIG-HED-NIBS LOC-KEY-SET

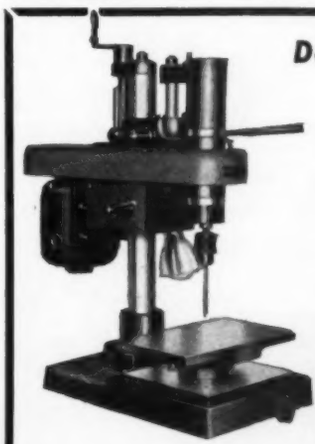
RE-SET-ABLE
Cooler dressing
Closer Tolerances
Micrometer Accuracy
Because: Wing key heat dissipation and absolute diamond lock nib.

● Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

All diamond sizes ¼ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.) Grinders instruction card free.

Send specifications and prints for prices on turning and boring form tools.

DIAMOND TOOL COMPANY, Nat Inc.
Sheldon M. Booth, Pres.
931 E. 41st Street CHICAGO, ILL.



Do your sensitive drilling on a

MAXI-JR-E

● Here is a high production unit for small holes from .004" to .250" diameter. Sturdy—smooth—fast—it is a self contained unit with 8 inch vertical adjustment on column. Drilling unit overhang from center of chuck to column 5". Vertical capacity 10". Available in spindle speeds from 750 to 12,000 r.p.m. Write for bulletin.

The Hamilton Tool Co.
HAMILTON OHIO

BARNESDRIL

Honers . . . Drillers

Write Today for Catalog A.

830 CHESTNUT ST.
Barnes Drill Co. ROCKFORD ILLINOIS, U.S.A.

Gives learners the precision of trained inspectors

Accuracy made easy gaging precision bores to fractions of .0001"

COMTORPLUG

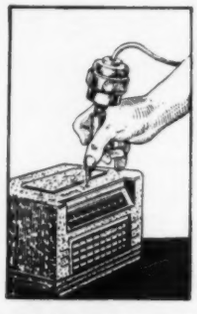
Measures holes to fractions of .0001" for size, out - of-round, front or back taper, etc.

Sizes: ¼" to 7" dia. and larger.

Used on the most critical airplane and ordnance work by the most skilled inspectors, Comtorplug at the same time is a highly efficient gage in the hands of learners. Due to unique features, it assures automatic 2-point gaging, self-aligning and self-centering. In addition to size, it shows tapers and out - of - round, and can gage to the very bottom of blind holes. Highly resultful when used at the machine in place of limit gages.

Request Bulletin 27

THE COMTOR CO.
68 RUMFORD AVE.
WALTHAM, MASS.



TORNADO Electric Writing Tool. Used for marking everything. Easily portable.

TORNADO Electric Writing Tools and Etchers

Protect Valuable Tools!

TORNADO Electric Writing Tools and Etchers mark everything of value that might be lost, misplaced or stolen. TORNADO Writing Tool marks brass, marble, tile, glass, plastics, wood, hard rubber, aluminum, steel and bronze.

TORNADO Electric Etcher marks iron, steel and steel alloy products. Burns permanent identification on various types of tools, dies, gauges, plates, gears, etc. Protects your valuable tools and other portable equipment!

Write for complete details

BREUER ELECTRIC MFG. CO.
5084 N. Ravenswood Ave., Chicago

WHERE-TO-BUY DIRECTORY

Pratt & Whitney Div Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.
Snyder Tool & Engrg. Co., Detroit

DRILLS, Portable Electric (See TOOLS, Portable Electric)

DRILLS, Portable Pneumatic (See TOOLS, Portable Pneumatic)

DRILLS, Radial
American Tool Works Co., Cincinnati
Bryant Machinery & Engrg Co., Chicago
Carlton Machine Tool Co., Cincinnati
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati Gilbert Mach. Tool Co., Cincinnati
Cleveland Punch & Shear Works, Inc., Cleveland
Fosdick Machine Tool Co., Cincinnati
General Machy. Corp., Hamilton, O.
Leland-Gifford Co., Worcester, Mass.
Morris Machine Tool Co., Cincinnati

DRILLS, Sensitive
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Barnes Co., W. F. & John, Rockford, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Buhr Mach. Tool Co., Ann Arbor, Mich.
Dalzen Tool & Mfg. Co., Detroit
Delta Mfg. Co., Milwaukee
Dumore Co., Racine, Wis.
Foote- Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Hamilton Tool Co., Hamilton, O.
Henry & Wright Mfg. Co., Hartford, Conn.
Kingsbury Mach. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
National Auto, Tool Co., Richmond, Ind.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Scherr Co., Geo., N. Y. C.
Walker-Turner Co., Inc., Plainfield, N. J.

DRILLS, Twist & Flat
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div. Niles-Bement-Pond Co. Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Victor Machinery Exchange, N. Y. C.

DRIVES, Machine
Cincinnati Lathe & Tool Co., Cincinnati
Dayton Rubber Mfg. Co., Dayton, O.
Drive-All Mfg. Co., Detroit
General Electric Co., Schenectady, N. Y.
Hardings Brothers, Inc., Elmira, N. Y.
Reed-Prentice Co., Worcester, Mass.
Reliance Elec & Engrg Co., Cleveland
Rivett Lathe & Grinder, Inc., Boston
Sheldon Mach. Co., Chicago
Turner Machinery Co., Kansas City, Mo.

DRIVES, Variable-Speed (See TRANSMISSIONS, Variable-Speed)

DRIVES, "V"-Belt
Allis-Chalmers Mfg. Co., Milwaukee
American Pulley Co., Philadelphia
Dayton Rubber Mfg. Co., Dayton, O.
Gates Rubber Co., Denver, Colo.

DRIVES, Worm
Adams Company, Dubuque, Iowa
Bilgram Gear & Mach. Wks., Philadelphia
Colonial Broach Co., Detroit
Detroit Tap & Tool Co., Detroit
Earle Gear & Mach Co., Philadelphia
Ganschow Gear Co., Chicago
Gear Specialties, Inc., Chicago
Grant Gear Works, Boston
Michigan Tool Co., Detroit
Perkins Machine & Gear Co., Springfield, Mass.
Philadelphia Gear Works, Philadelphia

DRYING Machines (See MACHINES. Washing and Drying)

DUPLICATORS, Pontographs
Detroit Universal Duplicator Co., Detroit

ELECTRICAL EQUIPMENT (see also, MOTORS, Electric; CONTROLLERS, Motor; Switches
Allen-Bradley Co., Milwaukee
General Electric Co., Schenectady, N. Y.
Square D. Co., Milwaukee
Westinghouse Elec & Mfg. Co., E. Pittsburgh, Pa.

ELECTRODES, Welding
Air Reduction, N. Y. C.
Aluminum Co. of America, Pittsburgh
American Brass Co., Waterbury, Conn.
American Steel & Wire Co., Cleveland
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., Milwaukee
Haynes-Stellite Co., N. Y. C.
Lincoln Electric Co., Cleveland
McKay Co., Pittsburgh, Pa.
Page Steel & Wire Div., Am. Chain & Cable Co., Monessen, Pa.
Roebling's Sons Co., John A., Trenton, N. J.
Ryerson & Son, Inc., Jos. T., Chicago
Westinghouse Elec. & Mfg Co., E. Pittsburgh, Pa.

ENAMELING & GALVANIZING MACHINES, Centrifugal
Barrett Co., Leon J., Worcester, Mass.

ENAMELS (See PAINTS, VARNISHES, etc.)

ENGRAVING MACHINES
Gorton Machine Co., Racine, Wis.
Ideal Commutator Dresser Co., Chicago
Reed-Prentice Co., Worcester, Mass.

ETCHERS, Electric
Breuer Elec. Mfg. Co, Chicago
Gorton Machine Co., Geo., Racine, Wis.
Ideal Commutator Dresser Co., Chicago

EXTRACTORS, Centrifugal, Oil (See SEPARATORS, Centrifugal)

EXTRACTORS, Screw
Cleveland Twist Drill Co., Cleveland
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mach Co., New Bedford, Mass.
Standard Tool Co., Cleveland

FANS, Man-Cooler (See BLOWERS)

FASTENERS, Lacings & Clamps, Belt
Rhoads & Sons, J. E., Philadelphia

FEEDS, Die (See FEEDS, Press)

CARLTON RADIAL DRILL

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

"Anti-friction Bearings Throughout"

The
CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

WHERE-TO-BUY DIRECTORY

FEEDS, Hydraulic
Ex-Cell-O Tool Corp., Detroit
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Sundstrand Mach. Tool Co., Rockford, Ill.
Vickers, Inc., Detroit

FEEDS, Press
Federal Press Co., Elkhart, Ind.
Henry & Wright Mfg. Co., Hartford, Conn.
Littell Machine Co., F. J., Chicago
Nilson Mach. Co., A. H., Bridgeport, Conn.
Producto Machine Co., Bridgeport, Conn.
Schrader's Sons, A., N. Y. C.
V. & O. Press Co., Hudson, N. Y.
Yoder Co., Cleveland
Zeh & Hahnemann Co., Newark, N. J.

FILE BANDS
Do All Co., Inc., Des Plaines, Ill.

FILES & RASPS
American Swiss File & Co., Elizabeth, N. J.
Atkins & Co., E. C. Indianapolis
Disston & Sons, Inc., Henry, Philadelphia
Nicholson File Co., Providence, R. I.
Oliver Instrument Co., Adrian, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Stow Mfg. Co., Inc., Binghamton, N. Y.
Strand & Co., N. A., Chicago

FILES, Rotary
Disston & Sons, Inc., Henry, Philadelphia
Hamilton Tool Co., Hamilton, O.
Strand & Co., N. A., Chicago

FILING MACHINES, Die
Ames Co., B. C., Waltham, Mass.
Continental Machines Inc., Milwaukee
Do All Co., Inc., Des Plaines, Ill.
Illinois Tool Co., Chicago
Oliver Instrument Co., Adrian, Mich.

FILTERS, Air
Cleveland Pneu. Tool Co., Cleveland
Curtis Pneu. Machy. Co., St. Louis
Norton Company, Worcester, Mass.

FINGERS, Feed
Eastern Machine Screw Corp., New Haven, Conn.
Hardinge Brothers, Inc., Elmira, N. Y.
Mitts & Merrill, Saginaw, Mich.
Rivett Lathe & Grinder, Inc., Boston

FITTINGS, Hydraulic
Watson-Stillman Co., Roselle, N. J.

FITTINGS, Wire-Rope
American Chain & Cable Co., Bridgeport, Conn.
American Steel & Wire Co., Chicago
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Cleveland
Roebling's Sons Co., John A., Trenton, N. J.

FIXTURES, Indexing
Brown & Sharpe Mfg. Co., Providence, R. I.
Hartford Special Machinery Co., Hartford, Conn.
Jefferson Mach. Tool Co., Cincinnati

FLAME-CUTTING MACHINES
Air Reduction, N. Y. C.
Oster Mfg. Co., Cleveland

FLEXIBLE SHAFT EQUIPMENT
Haskins Mfg. Co., R. G., Chicago
Morris Ltd., B. O. Birmingham, Eng.
Strand Mfg. Co., N. A., Chicago

FLUX, LIQUID & PASTE
Air Reduction, N. Y. C.
Atkins & Co., E. C. Indianapolis
Lincoln Electric Co., Cleveland

FORGES
Buffalo Forge Co., Buffalo, N. Y.

FORGING MACHINES (See also Presses, Forging)
Ajax Mfg. Co., Euclid, Cleveland
Elmes Engrg. Wks., Chas. F., Chicago
Hill Acme Co., Cleveland

FORGINGS (See Contract Work)

FORMING MACHINES
Cincinnati Shaper Co., Cincinnati
Cleveland Punch & Shear Wks., Cleveland
Consolidated Mach. Tool Corp., Rochester, N. Y.
Elmes Engrg. Works, Chas. F., Chicago
Farrel-Birmingham Co., Ansonia, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Schatz Mfg. Co., Poughkeepsie, N. Y.
Watson-Stillman Co., Roselle, N. J.
Yoder Co., Cleveland
Zeh & Hahnemann Co., Newark, N. J.

FURNACES, Electric
General Electric Co., Schenectady, N. Y.
Surface Combustion Corp., Toledo, O.
Westinghouse Electric & Mfg. Co., E. Pittsburgh

FURNACES, Gas
American Gas Furn. Co., Elizabeth, N. J.
Chicago Flexible Shaft Co., Chicago
Hones, Inc., Chas. A. Baldwin, N. Y.
Stark Tool Co., Waltham, Mass.
Strong, Carlisle & Hammond Co., Cleveland
Surface Combustion Corp., Toledo, O.

FURNACES, Oil
Chicago Flexible Shaft Co., Chicago
Surface Combustion Corp., Toledo

FURNITURE, Shop
Black & Decker Mfg. Co., Towson, Md. (Drill Stands)
Hamilton Tool Co., Hamilton, O.
New Britain-Gridley Machine Co., New Britain, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

GAGES, Amplifying
Federal Products Corp., Providence, R. I.
Pratt & Whitney Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Van Keuren Co., Watertown, Mass.

GAGES, Caliper
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Sheffield Corp., Dayton, O.
Slocumb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg Co., Woonsocket, R. I.

GAGES, Comparator
Ames Co., B. C., Waltham, Mass.
Federal Products Corp., Providence, R. I.
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Continental Machines, Inc., Minneapolis
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.

GAGES, Dial
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Comtor Co., Waltham, Mass.
Federal Products Corp., Providence, R. I.
Randall & Stickney, Waltham, Mass.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Drill-Center
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Morse Twist Drill Co., New Bedford, Mass.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland
Starrett Co., L. S., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

GAGES, Height
Brown & Sharpe Mfg. Co., Providence, R. I.
Continental Machines, Inc., Minneapolis
Lufkin Rule Co., Saginaw, Mich.
Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.

GAGES, Plug & Ring
Brown & Sharpe Mfg Co., Providence, R. I.
Cadillac Gage Co., Detroit
Carboloy Co., Detroit
Comtor Co., Waltham, Mass.
Crafts Co., Inc., Arthur A., Boston
Detroit Tap & Tool Co., Detroit
Federal Products Corp., Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Machine Co., Hartford, Conn.
Lincoln Park Tool & Gage Co., Lincoln Park, Mich.
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Slocomb Co., J. T., Providence, R. I.
Standard Gage Co., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Gage Grinding Co., Ferndale, Mich.
Vard Inc., Pasadena, Calif.
Van Keuren Co., Watertown, Mass.

GAGES, Pressure
Baldwin-Southwark Corp., Philadelphia
Brown Instrument Co., Philadelphia

GAGES, Profile
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Snap (See GAGES, Plug & Ring)

GAGES, Surface
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

GAGES, Thickness
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Randall & Stickney Co., Waltham, Mass.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread
Brown & Sharpe Mfg. Co., Providence, R. I.
Cadillac Gage Co., Detroit
Detroit Tap & Tool Co., Detroit
Federal Products Corp., Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Mach. Co., Hartford, Conn.
Lufkin Rule Co., Saginaw, Mich.
Michigan Tool Co., Detroit
Perfex Gage & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Slocomb Co., J. T. Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vard, Inc., Pasadena, Calif.

GAGES, Wire
Atkins & Co., E. C., Indianapolis
Brown & Sharpe Mfg. Co., Providence, R. I.
Disston & Sons, Inc., Henry, Philadelphia
Federal Products Corp., Providence, R. I.
Morse Twst Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland
Starrett Co., L. S., Athol, Mass.

The RANDALL & STICKNEY
Dial Test Indicator

A valuable instrument for erectors and inspectors

Especially convenient for checking accuracy in surfaces and spindle movements; also for obtaining comparative measurements on close work and for lining up work on machine tools. Horizontal arm adjustable and can be removed for independent use. With blocks fitted into T slot of base, this R&S indicator can be used against edge of surface plate for checking accuracy of long horisontal surfaces.

Dial diameter 2⅛"; base 8½x2¼".

Complete details on request.

RANDALL & STICKNEY, Waltham, Mass.

Sensational anti-skid and fire-proof treatment for floors. Write for literature or demonstration.

SPEEDI-DRI* OIL AND GREASE ABSORBENT

* Pat. Pending

East: REFINERS LUBRICATING CO. NEW YORK, N. Y.

S & W: WAVERLY PETROLEUM PRODUCTS CO., PHILA., PA.

PRESSES
FEEDS
AUTOMATIC EQUIPMENT
THE V & O Press Co. INC.
HUDSON, N. Y.

"GREENFIELD" No. 3 PLAIN TOOL and CUTTER GRINDER

Meets every need for fast, accurate tool sharpening

This sturdy machine assures speed, precision and convenience. Heavy construction and rigidity are unusual in a grinder of this type, an advantage which results in long life and maintained accuracy.

Within its capacity the No. 3 Greenfield will handle a wide variety of tool grinding including straight, taper or rose reamers, milling cutters, taps, drills, countersinks and counterbores.

FULL DETAILS ON REQUEST

SPECIFICATIONS

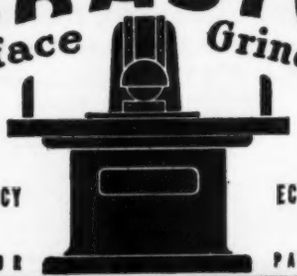
Swing over table—6¼"
Distance between centers—21"
Length of table travel—15"
Cross feed—6"
Vertical feed—7"
Capacity Cutters on Centers—6¼" dia.
Capacity cutters on holder—14" dia.
Capacity of chuck—3¾"
Capacity of Vise jaws—2¼"

PRODUCTION MACHINE CO.

Also manufacturers of Drilling Machines and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

ABRASIVE Surface Grinders



QUALITY ACCURACY DURABILITY ECONOMY

WRITE FOR PARTICULARS

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE, R. I.

The BARNES PRECISION CUTTER GRINDER

Grinds any profile desired with SPEED and ACCURACY

Regardless of how complicated or irregular the gang or cutter, the "Barnes" will grind it to the exact form desired with an accuracy that leaves nothing to be desired.

The speed and savings assured by this machine are available without any need to change existing cutter equipment. With the Barnes Precision Cutter Grinder the use of profile ground formed cutters is made possible thereby assuring the production of the high quality and quantity of work for which this type of cutter is so well known.

Write for Descriptive Circular

GENERAL MACHINERY CORP.
140 Federal St. Boston, Mass.

WHERE-TO-BUY DIRECTORY

GALVANIZING MACHINES (See ENAMELING & GALVANIZING MACHINES

GASES, Compressed
Air Reduction, N. Y. C.

GEAR-CUTTING MACHINES
Adams Co., Dubuque, Iowa
Barber-Colman Co., Rockford, Ill.
Bilgram Gear & Mach. Wks., Philadelphia
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Hobbing Mach. Co., Cleveland
Colonial Broach Co., Detroit
Cross Gear & Machine Co., Detroit
Farrell-Birmingham Co., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
General Mach. Corp., Hamilton, O.
Gleason Works, Rochester, N. Y.
Illinois Tool Works, Chicago
Lees-Bradner Co., Cleveland
Michigan Tool Co., Detroit
National Broach & Machine Co., Detroit
National Tool Co., Cleveland
Newark Gear Cutting Mach. Co., Newark
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Waltham Mach. Wks., Waltham, Mass.

GEAR-TESTING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Farrell-Birmingham Co., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
Illinois Tool Works, Chicago
Lees-Bradner Co., Cleveland
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Broach & Mach. Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.

GEARS, Cast
Braun Gear Corp., Brooklyn, N. Y.
Dodge Mfg. Corp., Mishawaka, Ind.
Earle Gear & Machine Co., Philadelphia
Fairfield Mfg. Co., Lafayette, Ind.
Farrel-Birmingham Co., Ansonia, Conn.
Foote Bros. Gear & Mach. Co., Chicago
Ganschow Gear Co., Chicago
General Electric Co., Schenectady, N. Y.
Grant Gear Works, Inc., Boston
Ohio Gear Co., Cleveland
Perkins Machine & Gear Co., Springfield, Mass.
Philadelphia Gear Works, Philadelphia

GEARS, Cut
Adams Co., Dubuque, Iowa
Allis-Chalmers Mfg. Co., Milwaukee
Baush Mach. Tool Co., Springfield, Mass.
Bilgram Gear & Mach. Wks., Philadelphia
Brown & Sharpe Mfg. Co., Providence, R. I.
Braun Gear Corp., Brooklyn, N. Y.
Carlyle Johnson Machine Co., Manchester, Conn.
Cincinnati Gear Co., Cincinnati
Cincinnati Lathe & Tool Co., Cincinnati
Detroit Bevel Gear Co., Detroit
Earle Gear & Machine Co., Philadelphia
Fairfield Mfg. Co., Lafayette, Ind.
Farrel-Birmingham Co., Buffalo, N Y.
Fellows Gear Shaper Co., Springfield, Vt.
Foote Bros. Gear & Mach. Co., Chicago
Ganschow Gear Co., Chicago
Gear Specialties Inc., Chicago
Gleason Works, Rochester, N. Y.
Grant Gear Works, Inc., Boston
Hartford Special Machinery Co., Hartford, Conn.
Meisel Press Mfg. Co., Boston
Michigan Tool Co., Detroit
Morse Chain Co., Ithaca, N. Y.
Ohio Gear Co., Cleveland
Perkins Machine & Gear Co., Springfield, Mass.
Philadelphia Gear Works, Philadelphia
Sier-Bath Gear Co., North Bergen, N. J.
Stahl Gear & Machine Co., Cleveland

GEARS, Master
Earle Gear & Mach. Co., Philadelphia
Fellows Gear Shaper Co., Springfield, Vt.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
National Broach & Mach. Co. Detroit
National Tool Co., Cleveland
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.

GEARS, Non-Metallic
Adams Co., Dubuque, Iowa
Bakelite Corp., N. Y. C.
Bilgram Gear & Mach. Wks., Philadelphia
Braun Gear Corp., Brooklyn, N. Y.
Earle Gear & Machine Co., Philadelphia
Farrel-Birmingham Co., Buffalo, N. Y.
Ganschow Gear Co., Chicago
Gear Specialties, Inc., Chicago
General Electric Co., Schenectady, N. Y.
Grant Gear Works Inc., Boston
Hartford Special Machinery Co., Hartford, Conn.
James Co., D. O., Chicago
Meisel Press Mfg. Co., Boston
Perkins Machine & Gear Co., Springfield, Mass.
Philadelphia Gear Works, Philadelphia
Sier-Bath Gear Co., North Bergen, N. J.
Stahl Gear & Machine Co., Cleveland
Taylor Machine Co., Cleveland
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

GOGGLES, Face Shields & Sweat Bands
American Optical Co., Southbridge, Mass.

GRAINS, Abrasive
Bay State Abrasive Prod. Co., Westboro, Mass.
Carborundum Co., Niagara Falls, N. Y.
Norton Co., Worcester, Mass.
Sterling Grinding Wheel Div., Tiffin, O.

GRINDERS, Abrasive-Belt
Delta Mfg. Co., Milwaukee
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
Mattison Machine Works, Rockford, Ill.
Mid-West Abrasive Co., Detroit
Porter Cable Mach. Co., Syracuse, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Walker-Turner Co., Inc., Plainfield, N. J.
Walls Sales Corp., N. Y. C.

GRINDERS, Bench & Pedestal
Atlas Press Co., Kalamazoo, Mich.
Black & Decker Mfg. Co., Towson, Md.
Blount Co., J. G., Everett, Mass.
Boyar-Schultz Corp., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Machinery & Engrg. Co., Chicago
Delta Mfg. Co., Milwaukee
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
Hardinge Brothers, Inc., Elmira, N. Y.
Hobart Brothers, Troy, Ohio
Norton Co., Worcester, Mass.
Porter Cable Mach. Co., Syracuse, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Queen City Machine Tool Co., Cincinnati
Schauer Machine Co., Cincinnati
Stow Mfg. Co., Binghamton, N. Y.
Union Twist Drill Co., Athol, Mass.
Vonnegut Moulder Corp., Indianapolis
Walker Co., O. S., Worcester, Mass.
Walker-Turner Co., Plainfield, N. J.
Walls Sales Corp., N. Y. C.

GRINDERS, Cam
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDERS, Carbide Tool
Blount Co., J. G., Everett, Mass.
Ex-Cell-O Corp., Detroit
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.

GRINDERS, Centerless
Cincinnati Grinders, Inc., Cincinnati
Heald Machine Co., Worcester, Mass.
Metal Carbides Corp., Youngstown, O.

GRINDERS, Chucking
Blanchard Machine Co., Cambridge, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Fitchburg Grinding Mach. Corp., Fitchburg, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.

GRINDERS, Contour
Baker Bros., Inc., Toledo, Ohio
Boyar-Schultz Corp., Chicago
Blanchard Machine Co., Cambridge, Mass.
Thompson Grinder Co., Springfield, O.

GRINDERS, Cutter & Tool
Abrasive Mach. Tool Co., E. Providence, R. I.
Barber-Colman Co., Rockford, Ill.
Blount Co., J. G., Everett, Mass.
Boyar-Schultz Corp., Chicago
Boggis & Co., H. P., Cleveland
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Carboloy Co., Inc., Detroit
Cincinnati Milling Mach. Co., Cincinnati
Continental Machines, Inc., Minneapolis
Covel Mfg. Co., Benton Harbor, Mich.
Delta Mfg. Co., Milwaukee
Ex-Cell-O Corp., Detroit
Fellows Gear Shaper Co., Springfield, Vt.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

WHERE-TO-BUY DIRECTORY

Gallmeyer & Livingston Co., Grand Rapids, Mich.
General Machinery Corp., Boston
Geometric Tool Co., New Haven, Conn.
Gorton Machine Co., Geo., Racine, Wis.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Heald Machine Co., Worcester, Mass.
Kearney & Trecker Co., Milwaukee
Landis Machine Co., Waynesboro, Pa.
Landis Tool Co., Waynesboro, Pa.
LeBlond Mach. Tool Co., R. K., Cincinnati
National Acme Co., Cleveland
Norton Co., Worcester, Mass.
Oliver Instrument Co., Adrian, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Scherr Co., Inc., Geo., N. Y. C.
Sellers & Co., Inc., Wm., Philadelphia
Standard Tool Co., Cleveland
Sundstrand Mach. Tool Co., Rockford, Ill.
Thompson Grinder Co., Springfield, O.
Union Twist Drill Co., Athol, Mass.
Walker Co., O. S., Worcester, Mass.

GRINDERS, Cylindrical
Arter Grinding Mach. Co., Worcester, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati Grinders, Inc., Cincinnati
Dumore Co., Racine, Wis.
Farrell-Birmingham Co., Ansonia, Conn.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Lempco Products, Inc., Bedford, O.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Norton Co., Worcester, Mass.
Thompson Grinder Co., Springfield, O.

GRINDERS, Disk
Delta Mfg. Co., Milwaukee
Fitchburg Gringing Machine Corp. Fitchburg, Mass.
Gardner Machine Co., Beloit, Wis.
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
Lempco Products, Inc., Bedford, O.
Porter Cable Mach. Co., Syracuse, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Queen City Mach. Tool Co., Cincinnati
Wall Sales Corp., N. Y. C.

GRINDERS, Drill & Tap
Blake Co., Edward, Newton Center, Mass.
Covel Mfg. Co., Benton Harbor, Mich.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
Sellers & Co., Wm., Philadelphia
Union Twist Drill Co., Athol, Mass.

GRINDERS, Face or Ring Wheel
Abrasive Mach. Tool Co., E. Providence R. I.
Blanchard Machine Co., Cambridge, Mass.
Blount Co., J. G., Everett, Mass.
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati Bickford Tool Co., Oakley, Cincinnati
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
Lempco Products, Inc., Bedford, O.

GRINDERS, Gear
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Gear Grinding Machine Co., Detroit
Gleason Works, Rochester, N. Y.
Lees-Bradner Co., Cleveland
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.

GRINDERS, Internal
Arter Grinding Mach. Co., Worcester, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Hartford Special Machinery Co., Hartford, Conn.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Lempco Products, Inc., Bedford, O.
Rivett Lathe & Grinder, Inc., Boston
Sav-Way Industries, Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.
Thompson Grinder Co., Springfield, O.
Van Norman Machine Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester, Mass.

GRINDERS, Jig
Moore Spec. Tool Co., Bridgeport, Conn.

GRINDERS, Knife & Shear-Blade
Abrasive Mach. Tool Co., E. Providence, R. I.
Arter Grinding Mach. Co., Worcester, Mass.
Atkins & Co., E. C., Indianapolis
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Hill-Acme Co., Cleveland
Mattison Machine Works, Rockford, Ill.

GRINDERS, Lathe-Attachment (See ATTACHMENTS, Lathe)

GRINDERS, Portable Electric (See also TOOLS, Portable Electric)
Black & Decker Mfg. Co., Towson, Md.
Chicago Wheel & Mfg Co., Chicago
Dremel Mfg. Co., Racine, Wis.
Dumore Co., Racine, Wis.
Hammond Machinery Bldrs., Inc., Kalamazoo, Mich.
Haskins Co., R. G., Chicago
Porter-Cable Mach. Co., Syracuse, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rotor Tool Co., Cleveland

GRINDERS, Spline
Fitchburg Grinding Machine Corp., Fitchburg, Mass.

GRINDERS, Surface
Abrasive Mach. Tool Co., E. Providence, R. I.
Arter Grinding Mach. Co., Worcester, Mass.
Atlantic Machinery Co., N. Y. C.
Blanchard Mach. Co., Cambridge, Mass.
Bridgeport Safety Emery Wheel Co., Inc., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Continental Machines, Inc., Minneapolis
Covel Mfg. Co., Benton Harbor, Mich.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Gardner Machine Co., Beloit, Wis.
Hammond Machy. Builders, Inc., Kalamazoo, Mich.
Heald Machine Co., Worcester, Mass.
Hill-Acme Co., Cleveland
Landis Tool Co., Waynesboro, Pa.
Leach Machinery Co., H., Providence, R. I.
Mattison Machine Works, Rockford, Ill.
Murchey Machine & Tool Co., Detroit
Norton Co., Worcester, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Thompson Grinder Co., Springfield, O.
Van Norman Machine Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester, Mass.

GRINDERS, Swing-Frame
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Jefferson Machine Tool Co., Cincinnati
Vonnegut Moulder Corp., Indianapolis

GRINDERS, Thread
Ex-Cell-O Corp., Detroit
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.

GRINDERS, Universal
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati
Covel Mfg. Co., Benton Harbor, Mich.
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Landis Tool Co., Waynesboro, Pa.
LeBlond Mach. Tool Co., R. K., Cincinnati
Morse Twist Drill & Machine Co., New Bedford, Mass.
Norton Co., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Boston
Thompson Grinder Co., Springfield, O.

GRINDING, Centerless (See CONTRACT WORK)

GRINDING FIXTURES
Industrial Engrg. Co., Inc., Minneapolis

GROOVERS, Oil
Hanson-Whitney Mach. Co., Hartford, Conn.
National Machine Tool Co., Cincinnati

GUARDS & SAFETY APPLIANCES, Machinery
Littleford Bros., Cincinnati
Schrader's Son, A., Brooklyn, N. Y.

HACK SAW BLADE GRINDING FIXTURES (See GRINDING FIXTURES)

HAMMERS, Drop
Farrel-Birmingham Co., Ansonia, Conn.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

HAMMERS, Portable Electric
Black & Decker Mfg. Co., Towson, Md.
Cleveland Pneu. Tool Co., Cleveland

HAMMERS, Power
General Machinery Corp., Hamilton, O.
Sellers & Co., Wm., Philadelphia

HAMMERS, Softfaced
Greene, Tweed & Co., N. Y. C.
Johnson Tool Co., Inc., E. Providence, R. I.

HANDLES, Crank & Machine
Machine Products Corp., Detroit
Williams & Co., J. H., Buffalo, N. Y.

HANDLES, File
Disston & Sons, Inc., Henry, Philadelphia
Nicholson File Co., Providence, R. I.
Parker-Kalon Corp., N. Y. C.

HANGERS, Shaft
Allis-Chalmers Mfg. Co., Milwaukee
American Pulley Co., Philadelphia
Brown & Sharpe Mfg. Co., Providence, R. I.
Dodge Mfg. Corp., Mishawaka, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hill-Acme Co., Cleveland
Morse Chain Co., Ithaca, N. Y.
S.K.F. Industries, Inc., Philadelphia

HARDENING MACHINES, Flame
Air Reduction, N. Y. C.
Farrell-Birmingham Co., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.

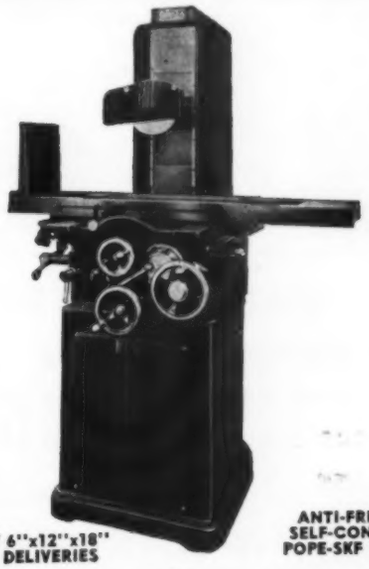
HEADERS, Rivet
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Hill-Acme Co., Cleveland
Tomkins-Johnson Co., Jackson, Mich.

HEADS, Boring
Bullard Co., Bridgeport, Conn.
Carboloy Co., Inc., Detroit
Criterion Mach. Wks., Beverly Hills, Cal.
Elmes Engrg. Wks., Chas. F., Chicago
Fray Machine Tool Co., Glendale, Calif.
Gairing Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Lovejoy Tool Co., Inc., Springfield, Vt.
Rickert-Shafer Co., Erie, Pa.
Scully-Jones & Co., Chicago
Taft-Peirce Mfg. Co., Woonsocket, R. I.

HEADS, Dividing
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati
Hartford Special Machry. Co., Hartford, Conn.
Jefferson Mach. Tool Co., Cincinnati
L-W Chuck Co., Toledo, O.
Scherr Co., Geo., N. Y. C.

HEADS, Drilling
Atlas Press Co., Kalamazoo, Mich.
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., Rockford, Ill.
Bradford Machine Tool Co., Cincinnati
Buffalo Forge Co., Buffalo, N. Y.
Errington Mech. Lab., Stapleton, N. Y.
Ettco Tool Co., Brooklyn, N. Y.
Ex-Cell-O Corp., Detroit
Foote-Burt Co., Cleveland

ATLANTIC
No. 2 Automatic Precision
SURFACE GRINDER

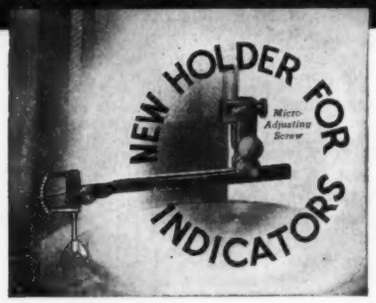


CAPACITY 6"x12"x18"
PROMPT DELIVERIES

ANTI-FRICTION
SELF-CONTAINED
POPE-SKF SPINDLE

ATLANTIC MACHINERY CORP.
149 Broadway New York, N. Y.

Save 60% TIME spent adjusting indicators



For Jigborers, Boring Mills, Milling Machines. It fits all popular indicators. The above illustration shown complete with extension bar.

NO more tiresome tapping your indicator into position. Now — after locking to approximate position, you obtain final setting by simply turning Micro Adjusting Screw. This exclusive, time-saving feature of the OSLUND HOLDER for all popular indicators gives you ***complete control.*** Write today for details.

ANOTHER TIME-SAVER

This Holder produced by makers of Oslund Indicators — the shockproof, constantly accurate indicator, whose 360° dial is read from *all* sides. Write Oslund today.

Oslund TOOL & DIE CO.
14 Sigourney St. Hartford, Conn.

SPEED AND PRECISION ON SMALL PARTS ASSURED BY THE G&S VERTICAL MILL AND JIG BORER

Designed particularly to speed up tool room jobs and production of instrument parts, arms and munitions, where highest precision is required.

Handles milling, boring, facing, routing with utmost convenience and accuracy. Sturdily built for long, hard service and maintained precision.

Send today for descriptive folder giving details and specifications

GRANITE STATE MACHINE CO., Inc.
MANCHESTER, NEW HAMPSHIRE
Exclusive Selling Agents:
H. Leach Machinery Co.
387 Charles St., Providence, R. I.

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

WHERE-TO-BUY DIRECTORY

HEADS, Grinding
Ex-Cell-O Corp., Detroit
Fitchburg Grinding Machine Corp., Fitchburg, Mass.
Heald Machine Co., Worcester, Mass.
Landis Machine Co., Waynesboro, Pa.

HEADS, Milling
Cincinnati Milling Mach. Co., Cincinnati
Kempsmith Machine Co., Milwaukee

HEADS, Slotting
Experimental Tool & Die Co., Detroit

HEADS, Tapping
Atlas Press Co., Kalamazoo, Mich.
Baker Bros., Inc., Toledo, O.
Barnes Co., W. F. & John, Rockford, Ill.
Bradford Mach. Tool Co., Cincinnati
Cross Gear & Machine Co., Detroit
Errington Mech. Lab., Stapleton, N. Y.
Ettco Tool Co., Brooklyn, N. Y.
Foote-Burt Co., Cleveland
Greenlee Bros. & Co., Rockford, Ill.
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
National Auto. Tool Co., Richmond, Ind.

HEATERS, Rivet
American Gas Furnace Co., Elizabeth, N. J.
General Electric Co., Schenectady, N. Y.

HEATERS, Unit
Buffalo Forge Co., Buffalo, N. Y.
Surface Combustion Corp., Toledo, O.
Wiedemann Machine Co., Philadelphia

HELMETS & SHIELDS, Welding
Air Reduction, N. Y. C.
American Optical Co., Southbridge, Mass.
Harnischfeger Corp., Milwaukee
Hobart Bros., Co., Troy, O.
Lincoln Electric Co., Cleveland

HOBBERS, Gear
Adams Co., Dubuque, Iowa.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Hobbing Mach. Co., Cleveland
Hall Planetary Co., Philadelphia
Lees-Bradner Co., Cleveland
Scherr Co., Geo., N. Y. C.

HOBS
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Hanson-Whitney Mach. Co., Hartford, Conn.
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

HOISTS, Chain
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Ford Chain Block Div., Am. Chain & Cable Co., Philadelphia
Wright Mfg. Div. of Am. Chain Cable Co., York, Pa.

HOISTS, Electric
Allis-Chalmers Mfg. Co., Milwaukee
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Harnischfeger Corp., Milwaukee
Philadelphia Gear Works, Philadelphia
Wright Mfg. Div., Amer. Chain & Cable Co., York, Pa.

HOISTS, Pneumatic
Curtis Pneumatic Machy. Co., St. Louis
Tomkins-Johnson Co., Jackson, Mich.

HOLDERS, Tool
Armstrong Bros. Tool Co., Chicago
Auto Ordnance Corp., Bridgeport, Conn.
Cincinnati Lathe & Tool Co., Cincinnati
Colonial Broach Co., Detroit
Detroit Tap & Tool Co., Detroit
Errington Mech. Lab., Stapleton, N. Y.
Gairing Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
Ready Tool Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Sturdimatic Tool Co., Detroit
Weldon Tool Co., Cleveland
Warner & Swasey Co., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

HONES & HONING MACHINES
Automotive Maintenance Machy. Co., No. Chicago, Ill.
Barnes Drill Co., Rockford, Ill.
Barnes Co., W. F., & John, Rockford, Ill.
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., Niagara Falls, N. Y.
Micromatic Hone Corp., Detroit
Midwest Abrasive Co., Detroit
Norton Co., Worcester, Mass.
Sunnen Products Co., St. Louis, Mo.

HOOKS, Hoist
Kropp Forge Co., Chicago
Williams & Co., J. H., Buffalo, N. Y.

HOSE, Flexible Metal
Chicago Metal Hose Corp., Maywood, Ill.

HOSE, Rubber
Dayton Rubber Mfg. Co., Dayton, O.
Gates Rubber Co., Denver, Colo.

HYDRAULIC EQUIPMENT
Denison Engineering Co., Columbus, Ohio
Ex-Cell-O Corp., Detroit
Gerotar May Div., Baltimore, Md.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Lempco Products, Inc., Bedford, O.
Vickers, Inc., Detroit
Watson-Stillman Co., Roselle, N. J.

INDEXING FIXTURES (see FIXTURES, Indexing)

INDICATORS, Dial (See GAGES, Dial)

INDICATORS, Speed
Brown & Sharpe Mfg. Co., Providence, R. I.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS
MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

DAVIS KEYSEATER

This low cost machine will handle any keyseating job in the shop up to 1 ¼ in.

Write for illustrated bulletin

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

WHERE-TO-BUY DIRECTORY

Brown Instrument Co., Philadelphia
Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.

INDICATORS, Temperature
Brown Instrument Co., Philadelphia

INSTRUMENTS, Hardness-Measuring
Shore Inst & Mfg. Co., Jamaica, N. Y.
Wilson Mechanical Inst. Co., N. Y. C.

INSTRUMENTS, Optical Inspection
Centerscope Instrument Co., Los Angeles, Calif.
Jones & Lamson Mach. Co., Springfield, Vt.
Vard Inc., Pasadena, Calif.

JACKS, Machinist's
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

JAWS, Boring Mill
Horton & Son Co., E. Windsor Locks, Conn.

JIG-BORING MACHINES
Baker Bros., Inc., Toledo, O.
Cincinnati Bickford Tool Co., Cincinnati
Fosdick Machine Tool Co., Cincinnati
Giddings & Lewis Mach. Tool Co., Fond du Lac, Wis.
Kearney & Trecker Products Corp., Milwaukee, Wis.
Knight Machinery Co., W. B., St. Louis
Linley Brothers Co., Bridgeport, Conn.
Machinery Mfg. Co., Los Angeles
Moore Special Tool Co., Inc., Bridgeport, Conn.
Pratt & Whitney Co., Div., Niles-Bement-Pond Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.

JIGS & FIXTURES (See CONTRACT WORK)

JOINTS, Universal
Baush Mach. Tool Co., Springfield, Mass.
Mollart Engrg. Co., Ltd., Surrey, Eng.
National Auto. Tool Co., Richmond, Ind.
Philadelphia Gear Works, Philadelphia

KEYSEATERS
American Broach & Mach. Co., Ann Arbor, Mich.
Consolidated Machine Tool Corp., Rochester, N. Y.
Davis Keyseater Co., Rochester, N. Y.
General Machinery Corp., Hamilton, O.
Lapointe Mach. Tool Co., Hudson, Mass.
Mitts & Merrill, Saginaw, Mich.
National Machine Tool Co., Cincinnati
Reed-Prentice Corp., Worcester, Mass.

KNIVES, Shear
Atkins & Co., E. C., Indianapolis
Cincinnati Shaper Co., Cincinnati
Cleveland Punch & Shear Works Co., Cleveland
Colonial Broach Co., Detroit
Disston & Sons, Inc., Henry, Philadelphia
Haynes Stellite Co., N. Y. C.
Michigan Tool Co., Detroit
Niagara Mach. & Tool Wks., Buffalo, N. Y.

KNURLS & KNURL HOLDERS
American Swiss File & Tool Co., Elizabeth, N. J.
Armstrong Bros. Tool Co., Chicago
Atlas Press Co., Kalamazoo, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Warner & Swasey Co., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

LAPPERS, Centerless
Cincinnati Grinders, Inc., Cincinnati
Ex-Cell-O Corp., Detroit
Production Mach. Co., Greenfield, Mass.
Ultra-Lap Mach. Co., Detroit

LAPPERS, Cylindrical & Flat
Automotive Maintenance Machy. Co., No. Chicago, Ill.
Ex-Cell-O Corp., Detroit
Mid-West Abrasive Co., Detroit
Moline Tool Co., Moline, Ill.
Norton Co., Worcester, Mass.
Sellers & Co., Inc., Wm., Philadelphia
Ultra-Lap Mach. Co., Detroit

LAPPERS, Gear
American Tool Works Co., Cincinnati
Colonial Broach Co., Detroit
Farrel-Birmingham Co., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
Michigan Tool, Co., Detroit
National Broach & Mach. Co., Detroit
Ultra-Lap Mach. Co., Detroit

LAPS, Toolmaker's
Boyar-Schultz Corp., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Producto Mach. Co., Bridgeport, Conn.
Starrett & Co., L. S., Athol Mass.
Ultra-Lap Mach. Co., Detroit

LATHE PANS
Littleford Bros., Cincinnati

LATHES, Automatic & Semi-Automatic
Bullard Co., Bridgeport, Conn.
Cleveland Auto. Mach. Co., Cleveland
Gisholt Machine Co., Madison, Wis.
Goss & deLeeuw Machine Co., New Britain, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Kingsbury Mach. Tool Corp., Keene, N. H.
LeBlond Mach. Tool Co., R. K., Cincinnati
Lipe-Rollway Corp., Syracuse, N. Y.
Lodge & Shipley Mach. Tool Co., Cincinnati
Monarch Machine Tool Co., Sidney, O.
National Acme Co., Cleveland
New Britain-Gridley Mach. Div., New Britain, Conn.
Porter Cable Mach. Co., Syracuse, N. Y.
Potter & Johnston Machine Co., Pawtucket, R. I.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
Rockford Mach. Tool Co., Rockford, Ill.
Seneca Falls Mach. Co., Seneca Falls, N. Y.
Smallpeice, Ltd., Beverly, Mass.
Snyder Tool & Engrg. Co., Detroit
Sunstrand Mach. Tool Co., Rockford, Ill.
Warner & Swasey Co., Cleveland
Wickman Corp., Detroit

● Important new developments on this machine make it adaptable to handling bigger jobs and insure the utmost in rigidity and accuracy. Improvements include:

. . . table size increased to 7" x 17½"
. . . three T-slots instead of one.
. . . longitudinal table travel increased to 10" and cross travel to 6" without running out of ways.
. . . table hand wheel on left.
. . . maximum distance table top to spindle nose increased from 9" to 11½"
. . . column ways shortened at lower end to provide more clearance
. . . table thickness increased by ½" to provide greater rigidity

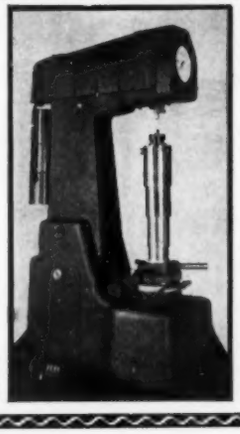
● *Write for Bulletin M giving complete features and detailed specifications.*

LINLEY BROTHERS CO.
664 State Street Extension
BRIDGEPORT, CONN. U.S.A.

FLATNESS and SMOOTHNESS
of Production Parts
The Ultra-Lap machine will finish your parts to a flatness of one light band or less . . . to a smoothness as low as one micro-inch R.M.S., any metal or material. Much faster, more uniform than hand method. Machine designed for you or we shall be pleased to lap your parts on a job basis. Ultra-Lap machines and service used by aircraft and many other war-time industries.
Ultra-Lap MACHINE COMPANY
207 McDOUGALL AVE. · DETROIT, MICH.

"ROCKWELL"
HARDNESS TESTER

BETTER and BETTER
EACH YEAR
SINCE 1921



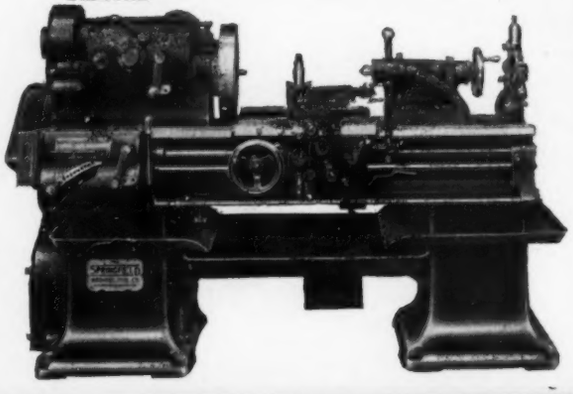
WILSON
MECHANICAL INSTRUMENT CO. INC
Concord Av. New York

SPRINGFIELD

GEARED HEAD LATHES

. . . for peacetime or preparedness production!

A lathe purchased now . . . for 24 hours a day, 7 days a week operation . . . must still meet your normal peacetime requirements in the future. The flexible, diversified, all-over efficiency of SPRINGFIELD lathes stamps them as ideal for defense and regular production. In all sizes and types. Write for descriptive bulletins.



The SPRINGFIELD MACHINE TOOL Co.
SPRINGFIELD, OHIO, U.S.A.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises — 3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request—Write!

BURKE MACHINE TOOL CO.
CONNEAUT · · · OHIO

WHERE-TO-BUY DIRECTORY

LATHES, Bench
Ames Co., B. C., Waltham, Mass.
Atlas Press Co., Kalamazoo, Mich.
Blount Co., J. G., Everett, Mass.
Bradford Machine Tool Co., Cincinnati
Gisholt Machine Co., Madison, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
LeBlond Mach. Tool Co., R. K., Cincinnati
Logan Engineering Co., Chicago
Pratt & Whitney Div., Niles- Bement-Pond Co., Hartford, Conn.
Rivett Lathe & Grinder, Inc., Boston
Schauer Machine Co., Cincinnati
Seneca Falls Mach. Co., Seneca Falls, N. Y.
Sheldon Machine Co., Chicago
Sidney Machine Tool Co., Sidney, O.
South Bend Lathe Works, S. Bend, Ind.
Stark Tool Co., Waltham, Mass.
Walker-Turner Co., Inc., Plainfield, N. J.
Warner & Swasey Co., Cleveland

LATHES, Crankshaft
American Tool Works, Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
LeBlond Mach. Tool Co., R. K., Cincinnati
Lodge & Shipley Machine Tool Co., Cincinnati
Potter & Johnston Machine Co., Pawtucket, R. I.
Sundstrand Mach. Tool Co., Rockford, Ill.
Sunnen Products Co., St. Louis
Wickes Brothers, Saginaw, Mich.

LATHES, Double End
Consolidated Machine Tool Corp., Rochester, N. Y.
Jones & Lamson Machine Co., Springfield, Vt.
General Machy. Corp., Hamilton, Ohio
LeBlond Machine Tool Co., R. K., Cincinnati
Wickes Brothers, Saginaw, Mich.

LATHES, Engine & Toolroom
American Tool Works Co., Cincinnati
Ames Co., B. C., Waltham, Mass.
Atlas Press Co., Kalamazoo, Mich.
Axelson Mfg. Co., Los Angeles
Bradford Machine Tool Co., Cincinnati
Bryant Machinery & Engrg. Co., Chicago
Cincinnati Gilbert Machine Tool Co., Cincinnati
Cincinnati Lathe & Tool Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
General Machinery Corp., Hamilton, O.
Gisholt Machine Co., Madison, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
Hendey Machine Co., Torrington, Conn.
LeBlond Mach. Tool Co., R. K., Cincinnati
Lodge & Shipley Mach. Tool Co., Cincinnati
Monarch Machine Tool Co., Sidney, O.
Morris Machine Tool Co., Cincinnati
Porter McLeod Mach. Tool Co., Hatfield, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Reed-Prentice Co., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Boston
Rockford Mach. Tool Co., Rockford, Ill.
Seneca Falls Mach. Co., Seneca Falls, N. Y.
Sheldon Machine Co., Chicago
Sidney Machine Tool Co., Sidney, O.
Simmons Mach. Tool Corp., Albany, N. Y.
South Bend Lathe Works, S. Bend, Ind.
Wickes Brothers, Saginaw, Mich.

LATHES, Gun
American Tool Works Co., Cincinnati

LATHES, Shell
American Tool Works Co., Cincinnati
Bullard Co., Bridgeport, Conn.
Cincinnati Lathe & Tool Co., Cincinnati
Cleveland Hobbing Mach. Co., Cleveland
Coulter Mach. Co., Jas., Bridgeport, Conn.
Jones & Lamson Mach. Co., Springfield, Vt.
Lipe-Rollway Corp., Syracuse, N. Y.
Lodge & Shipley Mach. Tool Co., Cincinnati
Morey Machinery Co., Inc., N. Y. C.
Seneca Falls Mach. Co., Seneca Falls, N. Y.
Smallpeice, Ltd., Beverly, Mass.
Sunstrand Mach. Tool Co., Rockford, Ill.

LATHES, Turret
Acme Machine Tool Co., Cincinnati
Bardons & Oliver, Inc., Cleveland
Bullard Co., Bridgeport, Conn.
Cincinnati Lathe & Tool Co., Cincinnati
Diehl Machine Works, G. M., Wabash, Ind.
General Machinery Corp., Hamilton, O.
Gisholt Machine Co., Madison, Wis.
Goss & deLeeuw Machine Co., New Britain, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hardinge Brothers, Inc., Elmira, N. Y.
International Machine Tool Co., Indianapolis
Jones & Lamson Mach. Co., Springfield, Vt.
Monarch Machine Tool Co., Sidney, O.
Morey Machinery Co., Inc., N. Y. C.
National Acme Co., Cleveland
Potter & Johnston Machine Co., Pawtucket, R. I.
Simmons Mach. Tool Corp., Albany, N. Y.
South Bend Lathe Wks., South Bend, Ind.
Springfield Mach. Tool Co., Springfield, O.
Warner & Swasey Co., Cleveland

LEVELS, Precision
Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Starrett Co., L. S., Athol, Mass.
Universal Boring Mach. Co., Hudson, Mass.

LIGHTING EQUIPMENT, Industrial
Fleurolier Mfgrs., Cleveland
General Elec. Co., Nela Park, Cleveland
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., Cleveland

LOCK NUTS
Bethlehem Steel Co., Bethlehem, Pa.
Elastic Stop Nut Corp., Elizabeth, N. J.
Fafnir Bearing Co., New Britain, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

LUBRICANTS
Acheson Colloids Corp., Port Huron, Mich.
Cities Service Co., N. Y. C.
Dixon Crucible Co., Jos., Jersey City, N. J.
Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia
Oakite Products, Inc., N. Y. C.
Shell Oil Corp., N. Y. C.
Sinclair Refining Co., N. Y. C.

NUMBERALL Numbering Machines

For stamping into metal etc.

Automatic Model No. 50

non-automatic Model No. 70

Sturdy construction, precision build, perfectly aligned numbers.
All sizes of figures.

Write for Catalog.

NUMBERALL STAMP & TOOL CO., Inc.
Huguenot Park, Staten Island, N. Y.

WHERE-TO-BUY DIRECTORY

Socony-Vacuum Oil Co., N. Y. C.
Standard Oil Co., of Ind., Chicago
Stuart Oil Co., D. A., Chicago
Sun Oil Co., Philadelphia
Swan-Finch Oil Corp., N. Y. C.
Texas Co., N. Y. C.
Tidewater Oil Co., N. Y. C.

LUBRICATING SYSTEMS
American Cable Div., Am. Chain & Cable Co., Bridgeport, Conn.
Bijur Lubricating Corp., Long Island City, N. Y.
De Laval Separator Co., N. Y. C.
Gits Bros. Mfg. Co., Chicago
Rivett Lathe & Grinder, Inc., Boston

MACHINE BASES
Clearing Machine Corp., Chicago
Littleford Bros, Cincinnati

MAGNETS, Lifting
General Electric Co., Schenectady, N. Y.

MALLETS (See TOOLS, Hand)

MANDRELS, Air Operated
Nicholson & Co., W. H., Wilkes-Barre, Pa.

MANDRELS, Expanding
Cleveland Twist Drill Co., Cleveland
Cushman Chuck Co., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Kearney & Trecker Corp., Milwaukee
Morse Twist Drill & Machine Co., New Bedford, Mass.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Producto Machine Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Tomkins-Johnson Co., Jackson, Mich.

MANDRELS, Solid (See ARBORS & MANDRELS)

MARKING MACHINES
Acromark Co., Elizabeth, N. J.
Gorton Machine Co., Geo., Racine, Wis.
Mathews & Co., James H., Pittsburgh
Noble & Westbrook Mfg. Co., East Hartford, Conn.
Numberall Stamp & Tool Co., Huguenot Park, N. Y.

MASKS (See RESPIRATORS)

MEASURING EQUIPMENT, Light Wave
Van Keuren Co., Watertown, Mass.

METAL-CLEANING EQUIPMENT
Barrett Co., Leon J., Worcester, Mass.
Barry-Wehmiller Mchry. Co., St. Louis, Mo.
Bullard Co., Bridgeport, Conn.
Detroit Rex Products Co., Detroit
Hobart Bros Co., Troy, O.
Stow Mfg. Co., Inc., Binghamton, N. Y.

METALS, Bearing
Bunting Brass & Bronze Co., Toledo, O.
Johnson Bronze Co., New Castle, Pa.
National Bearing Metals Corp., St. Louis
Ryerson & Son, Jos. T., Chicago
Westinghouse Electric & Mfg. Co., E. Pittsburgh

MICROMETERS
Brown & Sharpe Mfg. Co., Providence, R. I.
Davis & Thompson Co., Milwaukee
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Randall & Stickney, Waltham, Mass.
Scherr Co., Inc., George, N. Y. C.
Slocomb Co., J. T, Providence, R. I.
Starrett Co, L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

MICROSCOPES
Scherr Co., Geo., N. Y. C.

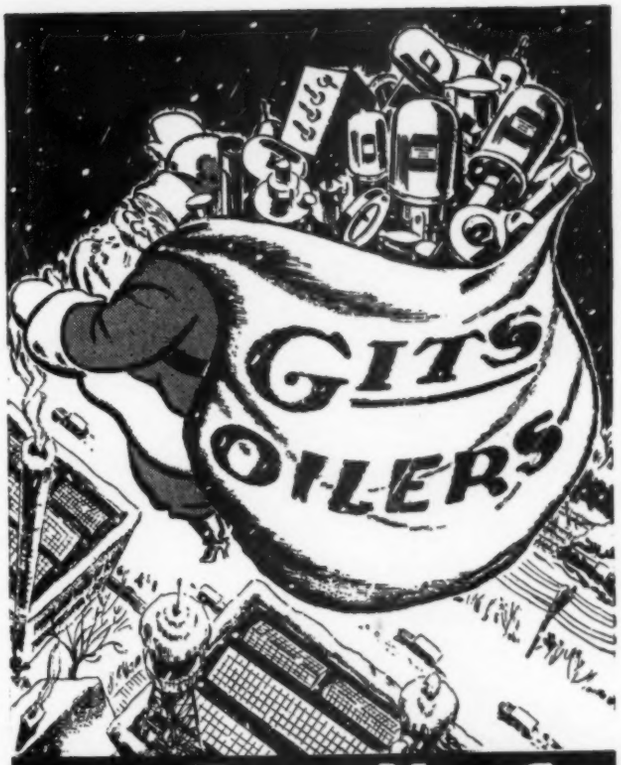
MILLERS, Automatic
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Fitchburg Engrg. Corp., Fitchburg, Mass.
Kearney & Trecker Corp., Milwaukee
Kent-Owens Machine Co., Toledo, O.
Producto Machine Co., Bridgeport, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

MILLERS, Bench
Ames Co., B. C., Waltham, Mass.
Atlas Press Co., Kalamazoo, Mich.
Burke Machine Tool Co., Conneaut, O.
Granite State Mach. Co., Inc., Manchester, N. H.
Hardinge Brothers, Inc., Elmira, N. Y.
Jafferson Mach. Tool Co., Cincinnati
Linley Bros. Co., Bridgeport, Conn.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Stark Tool Co., Waltham, Mass.

MILLERS, Duplex
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., Milwaukee
Fitchburg Engrg. Corp., Fitchburg, Mass.
General Machinery Corp., Hamilton, O.
Kearney & Trecker Corp., Milwaukee
Producto Machine Co., Bridgeport, Conn.
Snyder Tool & Engrg. Co., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach. Tool Co., Springfield, Mass.

MILLERS, Hand
Atlantic Machinery Co., N. Y. C.
Brown & Sharpe Mfg. Co., Providence, R. I.
Hardinge Brothers, Inc., Elmira, N. Y.
Jefferson Mach. Tool Co., Cincinnati
Kent-Owens Machine Co., Toledo, O.
Lucas & Sons, Inc., J. L., Bridgeport, Conn.
Nichols & Sons, W. H., Waltham, Mass.
Producto Machine Co., Bridgeport, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach. Tool Co., Springfield, Mass.

MILLERS, Plain & Universal
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati
Douglas Machinery Co., Inc., N. Y. C.
Fray Mach. Tool Co., Glendale, Calif.
Gorton Machine Co., Geo., Racine, Wis.
Granite State Mach. Co., Inc., Manchester, N. H.
Hardinge Brothers, Inc., Elmira, N. Y.
Jefferson Mach. Tool Co., Cincinnati
Kearney & Trecker Corp., Milwaukee



GITS BROS. MFG. CO.

1857 S. Kilbourn Avenue — Chicago, Illinois

30 years of oil cup experience

Speed!
Versatility!
Precision!

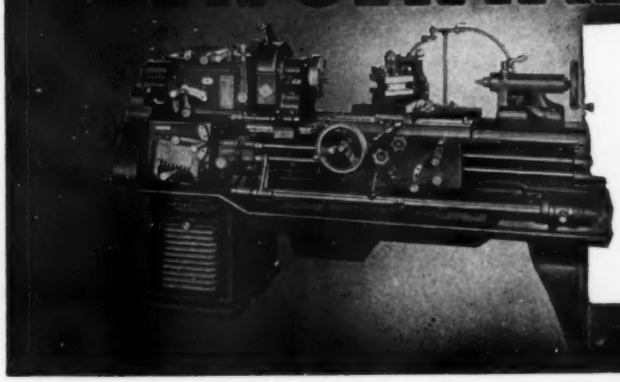
NICHOLSON EXPANDING MANDRELS

Ideal for high-speed production. Time-saving economy tools for holding work while being machined between centers on lathes, grinders, millers, shapers, etc. Made of hardened tool steel, precision ground. Sold singly or in sets. Prompt delivery. *Write for Bulletin No. 741.*

W. H. NICHOLSON & CO.
114 OREGON ST., WILKES-BARRE, PA.

Other Products: Arbor Presses—Control Valves—Steam Traps—Floats
Flexible Couplings—Compression Shaft Couplings

CINCINNATI LATHES



CINCINNATI LATHES
Accurate in Every Detail

Gears — precision cut, tempered and ground . . . Spindle — mounted on Roller Bearings to resist any combination of thrusts . . . Bed—extra heavy in construction . . . Ways and carriage hand scraped to a precision bearing. These features of Cincinnati Lathes add up to accuracy in every detail that insures precision results on every job. Write for complete specifications on 14" to 30" sizes to produce your work always most economically.

THE CINCINNATI LATHE & TOOL CO.
Marburg Road, Oakley — SPECIALISTS SINCE 1906 — Cincinnati, Ohio

FRAY

NO. 7-B RAM TYPE VERTICAL MILLING MACHINES

FEATURING all the flexibility of a rubber hose

Plus EXTREME RIGIDITY and UNEQUALLED RANGE

★

Write for literature

FRAY MACHINE TOOL CO.

517 W. WINDSOR ROAD, GLENDALE, CALIFORNIA

Makers of "All-Angle" Milling Machines & Milling Attachments

NO. 1 HEAVY DUTY GEARED HEAD MILLER

Available with Longitudinal Power Feed or Hand Feed to Table

Table: 6"x24"
Capacity 5½"x8½"x18"

Geared Spindle Speeds — 6 forward, 6 reverse. Optional spindle speed ranges available:

150- 675 R.P.M.
200- 900 R.P.M.
350-1350 R.P.M.

Anti-friction speed and spindle assemblies.

Built in coolant pump and piping. Motor in base.

PROMPT DELIVERIES

ATLANTIC MACHINERY CORP.

149 Broadway, New York, N. Y.

WHERE-TO-BUY DIRECTORY

Kempsmith Machine Co., Milwaukee
Kent-Owens Machine Co., Toledo, O.
Lucas & Son, Inc., J. L., Bridgeport, Conn.
Knight Machinery Co., W. B., St. Louis
Machinery Mfg. Co., Los Angeles
Nichols & Sons, W. H., Waltham, Mass.
Ohio Machine Tool Co., Kenton, O.
Producto Machine Co., Bridgeport, Conn.
Sidney Machine Tool Co., Sidney, O.
Van Norman Machine Tool Co., Springfield, Mass.

MILLERS, Planer Type
Cincinnati Planer Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Fitchburg Engrg. Corp., Fitchburg, Mass.
General Machinery Corp., Hamilton, O.
Gidding & Lewis Mach. Tool Co., Fond du Lac, Wis.
Kearney & Trecker Corp., Milwaukee
Sellers & Co., Inc., Wm., Philadelphia

MILLERS, Planetary
Hall Planetary Co., Philadelphia
Plan-O-Mill Corp., Royal Oak, Mich.

MILLERS, Profile
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Gorton Machine Co., Geo., Racine, Wis.
Knight Machinery Co., W. B., St. Louis
Morey Machinery Co., Inc., N. Y. C.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Reed-Prentice Corp., Worcester, Mass.

MILLERS, Thread
Adams Co., Dubuque, Iowa
Cleveland Auto. Mach. Co., Cleveland
Coulter Mach. Co., Jas., Bridgeport, Conn.
Hanson-Whitney Mach. Co., Hartford, Conn.
Lees-Bradner Co., Cleveland
Plan-O-Mill Corp., Royal Oak, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Rivett Lathe & Grinder, Inc., Boston
Scherr Co., Inc., Geo., N. Y. C.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waltham Mach. Works, Waltham, Mass.

MILLERS, Vertical
Blank & Buxton Machy, Co., Jackson, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Coulter Machine Co., James, Bridgeport, Conn.
General Machinery Corp., Hamilton, O.
Gorton Machine Co., Geo., Racine, Wis.
Granite State Mach. Co., Inc., Manchester, N. H.
Hardinge Brothers, Inc., Elmira, N. Y.
Jefferson Mach. Tool Co., Cincinnati
Kearney & Trecker Corp., Milwaukee
Kempsmith Mfg. Co., Milwaukee
Kent-Owens Machine Co., Toledo, Ohio
Knight Machinery Co., W. B., St. Louis
Linley Bros. Co., Bridgeport, Conn.
Machinery Mfg. Co., Los Angeles
Morey Machinery Co., Inc., N. Y. C.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Reed-Prentice Corp., Worcester, Mass.
Sidney Machine Tool Co., Sidney, O.
Sommer & Adams Co., Cleveland
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Machine Tool Co., Springfield, Mass.

MOLDING MACHINES, Plastic
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Reed-Prentice Corp., Worcester, Mass.
Watson-Stillman Co., Roselle, N. J.

MOLDS, Lead Hammer
Johnson Tool Co., Inc., E. Providence, R. I.

MOTORS, Electric
Allis-Chalmers Mfg. Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Century Electric Co., St. Louis
Dumore Co., Racine, Wis.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., Milwaukee
Howell Elec. Motors Co., Howell, Mich.
Lincoln Electric Co., Cleveland
Reliance Elec. & Engrg. Co., Cleveland
Wagner Electric Corp., St. Louis
Wesche Electric Co., B. A., Cincinnati
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

MOTORS, Geared (See MOTORS, Electric)

MOTORS, Hydraulic (see also PUMPS, Hydraulic)
Racine Tool & Mach. Co., Racine, Wis.
Sundstrand Mach. Tool Co., Rockford, Ill.
Vickers, Inc., Detroit

NAMEPLATES
Acromark Co., Elizabeth, N. J.
Matthews & Co., Jas H., Pittsburgh
Noble & Westbrook Mfg. Co., Hartford, Conn.

NIBBLERS
Campbell, Andrew C., Div. Amer. Chain & Cable Co., Bridgeport, Conn.
Mitts & Merrill, Saginaw, Mich.
Savage Tool Co., Savage, Minn.

NOZZLES, Blast-Cleaning
Littell Machine Co., F. J., Chicago
Norton Company, Worcester, Mass.
Schrader's Sons, A., N. Y. C.

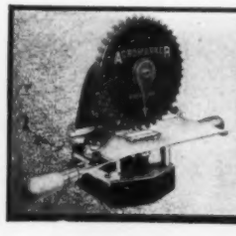
NUMBERING MACHINES (See MARKING MACHINES)

NUT-BLANKING MACHINES
Cleveland Automatic Mach. Co., Cleveland
National Acme Co., Cleveland
Potter & Johnston Machine Co., Pawtucket, R. I.

OIL STONES (See STONES, Sharpening)

OILERS, Automatic (See LUBRICATING SYSTEMS)

OILS, Cutting
Cities Service Co., N. Y. C.
Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia



FAST NEW WAY TO STAMP NUMBERS AND LETTERS STRAIGHT

THE ACROMARK CORP. H. O. BATES

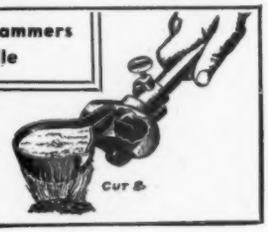
ELIZABETH, N. J.

Remelt and Cast Your Lead Hammers with the Field Mould and Ladle

Save time and money—keep lead hammers in good condition at all times—easy to use—fast. Made in 7 sizes for hammers from 1 to 11 lbs. Write for details.

Also, Lead Hammers, sizes 1 to 15 lbs. always in stock.

JOHNSON TOOL CO., INC.
East Providence Rhode Island, U.S.A.



WHERE-TO-BUY DIRECTORY

National Refining Co., Cleveland
Ohio Oil Co., Findlay, Ohio
Racine Tool & Mach. Co., Racine, Wis.
Shell Oil Co., Inc., N. Y. C.
Sinclair Refining Co., N. Y. C.
Socony-Vacuum Oil Co., N. Y. C.
Standard Oil Co., (Ind.), Chicago
Stuart Oil Co., D. A., Chicago
Sun Oil Co., Philadelphia
Swan-Finch Oil Corp., N. Y. C.
Texas Co., N. Y. C.
Tidewater Associated Oil Co., N. Y. C.
White & Bagley Co., Worcester, Mass.

OILS & GREASES (See LUBRICANTS)

OILS, Hydraulic
Cities Service Co., N. Y. C.
Gulf Oil Corp., Pittsburgh
Sheel Oil Co., Inc., N. Y. C.
Sinclair Refining Co., N. Y. C.
Socony-Vacuum Oil Co., N. Y. C.
Standard Oil Co. (Ind.), Chicago
Sun Oil Co., Philadelphia
Texas Co., N. Y. C.
Tidewater Associated Oil Co., N. Y. C.

OILS, Quenching & Tempering
Cities Service Co., N. Y. C.
Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia
Shell Oil Co., Inc., N. Y. C.
Sinclair Refining Co., N. Y. C.
Socony-Vacuum Oil Co., N. Y. C.
Standard Oil Co. (Ind), Chicago
Stuart Oil Co., D. A., Chicago
Sun Oil Co., Philadelphia
Texas Co., N. Y. C.
Tidewater Oil Co., N. Y. C.

PACKING, Hydraulic
Elmes Engrg. Wks., Chas. F., Chicago
Greene, Tweed & Co., N. Y. C.
Houghton & Co., E. F., Philadelphia
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Rhoads & Sons, J. E., Philadelphia
Watson-Stillman Co., Roselle, N. J.

PAGING SYSTEMS
Executone, Inc., N. Y. C.

PAINTS, Varnishes, etc.
Devoe & Raynolds Co., Inc., N. Y. C.
Dixon Crucible Co., Jos., Jersey City, N. J.

PAPER & CLOTH, Abrasive
Behr-Manning Corp., Troy, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Midwest Abrasive Co., Detroit

PARALLELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.

PENCILS
Dixon Crucible Co., Jos., Jersey City, N. J.

PHOSPHOR BRONZE
Bunting Brass & Bronze Co., Toledo
Johnson Bronze Co., New Castle, Pa.

PICKLING MACHINES (See METAL-CLEANING EQUIPMENT)

PINS, Dowel & Taper
Allen Mfg. Co., Hartford, Conn.
American Steel & Wire So., Cleveland
Bethlehem Steel Co., Bethlehem, Pa.
Danly Machine Specialties, Inc., Chicago
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland

PIPE CUTTING & THREADING MACHINES
Armstrong Bros. Tool Co., Chicago
Bardons & Oliver, Inc., Cleveland
Cleveland Automatic Mach. Co., Cleveland
Hill Acme Co., Cleveland
Landis Mach. Co., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit
Oster Mfg. Co., Cleveland
Peerless Machine Co., Racine, Wis.
Rickert-Shafer Co., Erie, Pa.
Scherr Co., Inc., Geo., N. Y. C.
Warner & Swasey Co., Cleveland

PLANERS
Cincinnati Planer Co., Cincinnati
Cleveland Punch & Sheer Works Co., Cleveland
Consolidated Mach. Tool Corp., Rochester, N. Y.
General Machinery Corp., Hamilton, O.
Liberty Planers, Inc., Hamilton, O.
Ohio Machine Tool Co., Kenton, O.
Rockford Mach. Tool Co., Rockford, Ill.
Sellers & Co., Inc., Wm., Philadelphia

PLANERS, Plate
Baldwin-Southwark Corp., Philadelphia
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Mach. Tool Corp., Rochester, N. Y.
General Machinery Corp., Hamilton, O.
Ohio Machine Tool Co., Kenton, O.
Sellers & Co., Wm., Philadelphia

PLATES, Angle
Brown & Sharpe Mfg. Co., Providence, R. I.
Lombard Governor Corp., Ashland, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Smith Tool & Engrg. Co., Bucyrus, O.
Starrett Co., L. S., Athol. Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

PLATES, Surface
Baumbach Mfg. Co., E. A., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Mfg. Co., Milwaukee
Lombard Governor Corp., Ashland, Mass.
Machine Products Corp., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Smith Tool & Engrg. Co., Bucyrus, O.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

PLATFORMS, SKID (See TRUCKS, Hand Lift)

PLATING, Brass, Chromium, Copper
Chromium Corp. of Amer., N. Y. C.
Industrial Chromium Corp., Holyoke, Mass.

PLATING, Spot
Industrial Chromium Corp., Holyoke, Mass.

POTENTIOMETERS
Brown Instrument Co., Philadelphia
General Electric Co., Schenectady, N. Y.

POTS, Melting
Farrel-Birmingham Co., Ansonia, Conn.
General Electric Co., Schenectady, N. Y.
Hones, Inc., Chas. A., Baldwin, N. Y.
Strong, Carlisle & Hammond Co., Cleveland
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

PRESSES, Arbor
American Broach & Machine Co., Ann Arbor, Mich.
Atlas Press Co., Kalamazoo, Mich.
Barnes Co., W. F. & John, Rockford, Ill.
Elmes Engrg. Wks., Chas. F., Chicago
Famco Machine Co., Racine, Wis.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Lempco Products, Inc., Bedford, O.
Lucas Machine Tool Co., Cleveland
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Producto Machine Co., Bridgeport, Conn.
Sheldon Machine Co., Chicago
Tomkins-Johnson Co., Jackson, Mich.
Watson-Stillman Co., Roselle, N. J.
Wilson, K. R., Buffalo, N. Y.
Wright Mfg. Div., American Chain & Cable Co., York, Pa.

KNIGHT VERSATILE MILLERS ACCURATE · RIGID

FOR FURTHER DETAILS
SEE FULL PAGE AD
IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.
ST. LOUIS MISSOURI

Made for **PRECISION ACCURACY**

Smith MASTER SURFACE PLATES

Every Smith Surface Plate is a true master plate -- with precision lapped surface, relieved by hand flaking to provide the maximum number of uniform bearing points to meet gauge makers' requirements and to prevent gauges and the like from "freezing". Aircraft and Ordnance plants, demanding the greatest accuracy in surface plates, reorder many times.

Write for new descriptive literature.

SMITH TOOL & ENGINEERING CO.
Precision Measuring Equipment
801 N. WINGERT ST. BUCYRUS, OHIO

AVAILABLE SIZES
8 x 12
9 x 14
12 x 18
18 x 18
18 x 24
24 x 24
20 x 30
24 x 36
30 x 36
30 x 60
36 x 68
OTHER SIZES MADE TO ORDER

PROMPT DELIVERY ON STANDARD SIZES

Douglas 32" X 8" PLAIN MILLER
FOR SMALL PARTS PRODUCTION

EARLY DELIVERY
BY LARGE SCALE PRODUCTION

DOUGLAS MACHINERY CO. INC.
150 BROADWAY NEW YORK, N. Y.

SECRET OF TUTHILL PUMP DEPENDABILITY

The inside story of Tuthill dependability can be summed up in two words: PRECISION MANUFACTURE. Hundreds of thousands of Tuthill Pumps in service prove that it takes skill, experience and production efficiency to create equipment so outstanding and dependable in performance.

Today, more than ever, you need these precision ingredients. That's why it will pay you to specify Tuthill positive displacement, internal-gear rotary pumps.

COOLANT PUMPS . . .
. . . Capacities up to 50 g.p.m.
LUBRICATING PUMPS . . .
. . . Capacities up to 50 g.p.m.
HYDRAULIC PUMPS . . .
. . . Pressures to 400 p.s.i.
LIQUID TRANSFER PUMPS . . .
. . . Capacities to 200 g.p.m.
FUEL OIL PUMPS . . .
. . . Capacities to 50 g.p.m.

Write for Tuthill Catalog

Tuthill PUMP COMPANY
939 EAST 95TH STREET • Chicago

LITTELL AUTOMATIC CENTERING REELS

Plain and Motor Driven
Spindle and Cradle Types

No. 3 Littell Automatic Centering Reel. Coil capacity, 300 lbs.

FASTER loading, centering and unreeling of coil stock is assured with LITTELL Automatic Centering Reels. Made in 100-lb. to 20,000-lb. capacities, for hand or automatic feeding. Spindle and Cradle types.

LITTELL PRODUCTS INCLUDE:

Roll Feed units for punch presses—Feeding and Straightening Machines—Power Straightening Machines—Ball-Bearing Reels—Winders—Coil Cradles—Air-Blast Valves and Nozzles—Safety Pickers—Scrap Cutters—Oilers—Assembly Machines—and Automatic Centering Reels. *REQUEST BULLETINS.*

ASK FOR BULLETINS

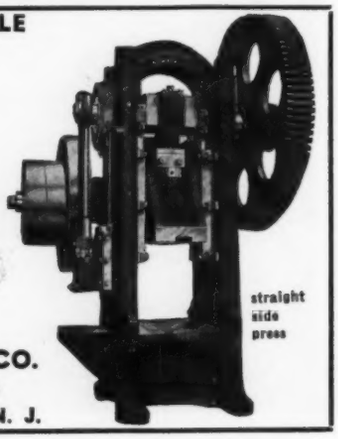
F.J. LITTELL MACHINE CO.
4169 RAVENSWOOD AVE. CHICAGO, ILL.

STRAIGHT SIDE SINGLE CRANK PRESSES
for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.



straight side press

ZEH & HAHNEMANN CO.
180 Vanderpool Street
NEWARK N. J.

WHERE-TO-BUY DIRECTORY

PRESSES, Crank (See PRESSES, Power)

PRESSES, Foot
Etna Machine Co., Toledo, O.
Famco Machine Co., Racine, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Nilson Mach. Co., A. H., Bridgeport, Conn.
V. & O. Press Co., Hudson, N. Y.

PRESSES, Forging
Baldwin-Southwark Corp., Philadelphia
Beatty Mach. & Mfg. Co., Hammond, Ind.
Bethlehem Steel Co., Bethlehem, Pa.
Clearing Machine Corp., Chicago
Cleveland Punch & Shear Works Co., Cleveland
Elmes Engrg. Wks., Chas. F., Chicago
Hill Acme Co., Cleveland
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Watson-Stillman Co., Roselle, N. J.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES, Hydraulic
American Broach & Machine Co., Ann Arbor, Mich.
Atlas Press Co., Kalamazoo, Mich.
Baldwin-Southwark Corp., Philadelphia
Beatty Mach. & Mfg. Co., Hammond, Ind.
Bethlehem Steel Co., Bethlehem, Pa.
Clearing Machine Corp., Chicago
Colonial Broach Co., Detroit
Davis Keyseater Co., Rochester, N. Y.
Elmes Engrg. Wks., Chas. F., Chicago
Farrel-Birmingham Co., Ansonia, Conn.
General Machinery Corp., Hamilton, O.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Lapointe Mach. Tool Co., Hudson, Mass.
Lempco Products, Inc., Bedford, O.
Tomkins-Johnson Co., Jackson, Mich.
Watson-Stillman Co., Roselle, N. J.
Wright Mfg. Div. Amer. Chain Co., Inc., Bridgeport, Conn.

PRESSES, Power (Punch)
Beatty Mach. & Mfg. Co., Hammond, Ind.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati
Clearing Mach. Co., Chicago
Cleveland Crane & Engrg. Co., Steelweld Machry. Div., Wickliffe, Ohio
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Davis Keyseater Co., Rochester, N. Y.
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J
Hendey Machine Co., Torrington, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Kent-Owens Machine Co., Toledo, O.
Lempco Products, Inc., Bedford, O.
Mitts & Merrill, Saginaw, Mich.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Nilson Mach. Co., A. H. Bridgeport, Conn.
Ryerson & Son, Inc., Jos. T., Chicago
Schatz Mfg. Co., Poughkeepsie, N. Y.
V. & O. Press, Hudson, N. Y.
Wiedeman Machine Co., Philadelphia
Zeh & Hahnemann Co., Newark, N. J.

PRESSES, Screw
Barnes Co., W. F. & John, Rockford, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Producto Machine Co., Bridgeport, Conn.
Schatz Mfg. Co., Poughkeepsie, N. Y.
Wright Mfg. Div., American Chain & Cable Co., York, Pa.
Zeh & Hahnemann Co., Newark, N. J.

PRESSES, Straightening
Baldwin-Southwark Corp., Philadelphia
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Elmes Engrg. Wks., Chas. F., Chicago
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Morse Twist Drill & Mach. Co., New Bedword, Mass.
Nilson Mach. Co., A. H., Bridgeport, Conn.
Springfield Mach. Tool Co., Springfield, O.
Watson-Stillman Co., Roselle, N. J.

PRESSES, Turret Punch
Federal Press Co., Elkhart, Ind.
Wiedemann Machine Co., Philadelphia

PROFILERS (See MILLERS, Vertical)

PROJECTORS, Contour
Jones & Lamson Machine Co., Springfield, Vt.
Portman Machine Tool Co., Mt. Vernon, N. Y.
Scherr Co., Geo., N. Y. C.

PROTECTORS, Motor
Spencer Thermostat Co., Attleboro, Mass.

PROTRACTORS, Optical
Scherr Co., Geo., N. Y. C.

PULLEYS, Iron, Steel & Wood
American Pulley Co., Philadelphia
Brown & Sharpe Mfg. Co., Providence, R. I.
Carlyle Johnson Machine Co., Manchester, Conn.
Dayton Rubber Mfg. Co., Dayton, O.
Dodge Mfg. Corp., Mishawaka, Ind.
Hill Acme Co., Cleveland
Reeves Pulley Co., Columbus, Ind.

PULLEYS, V-Belt (See SHEAVES, V-Belt)

PUMPS, Centrifugal
Allis-Chalmers Mfg. Co., Milwaukee
Brown & Sharpe Mfg. Co., Providence, R. I.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Pioneer Engrg. & Mfg. Co., Detroit
Ruthman Machry. Co., Cincinnati
Tomkins-Johnson Co., Jackson, Mich.

PUMPS, Hydraulic
Allis-Chalmers Mfg. Co., Milwaukee
Baldwin-Southwark Corp., Philadelphia
Barnes Co., W. F. & John, Rockford, Ill.
Elmes Engrg. Wks., Chas. F., Chicago
Gerotor May Div., Baltimore, Md.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Lapointe Mach. Tool Co., Hudson, Mass.
Racine Tool & Machine Co., Racine, Wis.
Sundstrand Mach. Tool Co., Rockford, Ill.
Tuthill Pump Co., Chicago
Vickers, Inc., Detroit
Watson-Stillman Co., Roselle, N. J.

PUMPS, Lubricant and Coolant
Bijur Lubricating Corp., Long Island City, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buffalo Forge Co., Buffalo, N. Y.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Gray Mills Co., Chicago
Pioneer Engrg. & Mfg. Co., Detroit
Rivett Lathe & Grinder, Inc., Boston
Ruthman Machinery Co., Cincinnati
Sundstrand Mach. Tool Co., Rockford, Ill.
Tompkins-Johnson Co., Jackson, Mich.
Tuthill Pump Co., Chicago
Vickers, Inc., Detroit

PUNCHES, Center & Hand (See TOOLS, Hand)

PURIFIERS, Oil & Coolant
Barrett Co., Leon J., Worcester, Mass.
DeLaval Separator Co., N. Y. C.
Sparkler Mfg. Co., Mundelein, Ill.

PYROMETERS, Indicating & Recording
Brown Instrument Co., Philadelphia

QUENCHERS
American Gas Furn. Co., Elizabeth, N. J.
Farrel-Birmingham Co., Buffalo, N. Y.
Gleason Works, Rochester, N. Y.

RACKS, Gear (See GEARS, Cut)

RASPS (See FILES & RASPS)

RATCHETS (See GEARS, Cut)

REAMERS, Adjustable
Barber-Colman Co., Rockford, Ill.
Black Drill Co., Cleveland
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Detroit
Cleveland Twist Drill Co., Cleveland
Colonial Broach Co., Detroit
Gairing Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.

WHERE-TO-BUY DIRECTORY

Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.

REAMERS, Pipe
American Swiss File & Tool Co., Elizabeth, N. J.
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Cleveland Twist Drill Co., Cleveland
Detroit Tap & Tool Co., Detroit
Gairing Tool Co., Detroit
Greenfield Tap & Die Corp., Greenfield, Mass.
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Oster Mfg. Co., Cleveland
Standard Tool Co., Cleveland
Torrington Co., Torrington, Conn.

REAMERS, Shell
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Greenfield Tap & Die Corp., Greenfield, Mass.
Illinois Tool Works, Chicago
Morse Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Schultz & Anderson Co., Newark, N. J.
Union Twist Drill Co., Athol, Mass.

REAMERS, Solid
Barber-Colman Co., Rockford, Ill.
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Colonial Broach Co., Detroit
Detroit Tap & Tool Co., Detroit
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Garing Tool Co., Detroit
Genesee Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., N. Y. C.
Holman Reamer Co., Manchester, Conn.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Vascoloy-Ramet Corp., N. Chicago, Ill.
Wendt Sonis Co., Hannibal, Mo.

REAMING MACHINES
Blanchard Machine Co., Cambridge, Mass.
Barnes Co., W. F. & John, Rockford, Ill.
Cleveland Pneu. Tool Co., Cleveland
Rotor Tool Co., Cleveland
Van Norman Machine Tool Co., Springfield, Mass.

RECORDERS, Speed (See **INDICATORS, Speed**)

RECORDERS, Temperature & Pressure
Brown Instrument Co., Philadelphia

REDUCERS, Motorized Speed
Allis-Chalmers Mfg. Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Dumore Co., Racine, Wis.
Earle Gear & Machine Co., Philadelphia
Foote Bros. Gear & Mach. Co., Chicago
Ganschow Gear Co., Chicago
Gear Specialties, Inc., Chicago
General Electric Co., Schenectady, N. Y.
James Co., D. O., Chicago
Meisel Press Mfg. Co., Boston, Mass.
Ohio Gear Co., Cleveland
Philadelphia Gear Works, Philadelphia
Reliance Elec. & Engrg. Co., Cleveland
Wagner Electric Corp., St. Louis
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

REDUCERS, Speed
Adams Co., Dubuque, Iowa
Davis & Thompson Co., Milwaukee
Earle Gear & Machine Co., Philadelphia
Farrel-Birmingham Co., Buffalo, N. Y.
Ganschow Gear Co., Chicago
Gear Specialties, Inc., Chicago
General Electric Co., Schenectady, N. Y.
General Machinery Corp., Hamilton, O.
Grant Gear Works, Inc., Boston
James Co., D. O., Chicago
Morse Chain Co., Ithaca, N. Y.
Ohio Gear Co., Cleveland
Philadelphia Gear Works, Philadelphia
Racine Tool & Mach. Co., Racine, Wis.
Stahl Gear & Machine Co., Cleveland
Sundstrand Mach. Tool Co., Rockford, Ill.
Vickers, Inc., Detroit
Watson-Stillman Co., Roselle, N. J.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

REELS, Strip-Stock & Wire
Littell Machine Co., F. J., Chicago
Nilson Mach. Co., A. H., Bridgeport, Conn.
Yoder Co., Cleveland

REFRACTORIES
Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., Niagara Falls, N. Y.
Norton Co., Worcester, Mass.
Strong, Carlisle & Hammond Co., Cleveland

REFRIGERATORS, Industrial
Deep Freeze Division, Motor Products Corp., Chicago

REGULATORS, Speed
Vickers, Inc., Detroit

REGULATORS, Temperature
American Gas Furn. Co., Elizabeth, N. J.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence,

RIFLING MACHINES, Gun
American Broach & Machine Co., Ann Arbor, Mich.
Illinois Tool Works, Chicago
LeBlond Mach. Tool Co., R. K., Cincinnati
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.

RIVETERS, Electric Power
Buffalo Forge Co., Buffalo, N. Y.
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Linley Bros. Co., Bridgeport, Conn.
Tomkins-Johnson Co., Jackson, Mich.

RIVETERS, Pneumatic & Hydraulic
Baldwin-Southwark Corp., Philadelphia
Cleveland Pneu. Tool Co., Cleveland
Elmes Engrg. Wks., Chas. F., Chicago
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Watson-Stillman Co., Roselle, N. J.

RIVETS
Aluminum Co. of America, Pittsburgh
American Steel & Wire Co., Pittsburgh
Bethlehem Steel Co., Bethlehem, Pa.

ROLLS, Bending
Baldwin-Southwark Corp., Philadelphia
Buffalo Forge Co., Buffalo, N. Y.
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
General Machinery Corp., Hamilton, O.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Ryerson & Son, Inc., Jos. T., Chicago

ROLLS, Forging
Bethlehem Steel Co., Bethlehem, Pa.

ROPE, Wire
American Cable Div. of Am. Chain & Cable Co., N. Y. C.
Bethlehem Steel Co., Bethlehem, Pa.
Page Steel & Wire Div., Am. Chain & Cable Co., Monessen, Pa.
Roebling's Sons Co., John A., Trenton, N. J.
Ryerson & Son, Inc., Jos. T., Chicago

ROUTERS
Consolidated Mach. Tool Corp., Rochester, N. Y.
Gorton Machine Co., Geo., Racine, Wis.
Knight Machy. Co., W. B., St. Louis
Onsrud Machine Works, Chicago
Reed-Prentice Corp., Worester, Mass.

RULES & TRIANGLES, Machinists'
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.
Van Keuren Co., Watertown, Mass.

The mounting flange of this new Gusher Pump is comparatively large, so as to be interchangeable with larger size Gusher Pumps. Therefore, easily adaptable to changing types of machine production. Right or left discharge. 1/10 h.p. Capacity: through ½" pipe at 5 ft. head is 10 g.p.m. Specifications and data on request. Write!

RUTHMAN
GUSHER
COOLANT PUMPS

The Gusher line of vertical motor driven Coolant Pumps give you exclusive advantages and patented features. For instance, Ruthman gives you the Twin Equalized Intake type with hydrostatic balance. This automatically cleans out intake chambers when discharge line is throttled. No building up pressure. Other *exclusive* features speed production. Gusher Pumps are recognized leaders. Write!

THE RUTHMAN MACHINERY CO.
1809 READING ROAD CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

GRANT

RIVETERS—PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

NEED SUB-CONTRACTS?
Investigate the possibilities offered you through the CONTRACT WORK SECTION!
For details, write
CONTRACT WORK DEPT.
American Machinist 330 W. 42nd St., N. Y. C.

HOLMAN *BETTER, FASTER HOLE FINISHING*

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

WHERE-TO-BUY DIRECTORY

RUSTPROOFING & SLUSHING COMPOUNDS
Bakelite Corp., N. Y. C.
Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia
Oakite Products Co., N. Y. C.
Socony-Vacuum Oil Co., Inc., N. Y. C.
Standard Oil Co. of Indiana, Chicago
Tidewater Oil Co., N. Y. C.

SAFETY EQUIPMENT
American Optical Co., Southbridge, Mass.
Littleford Bros., Cincinnati

SANDERS, Machine & Portable
Black & Decker Mfg. Co., Towson, Md.
Carborundum Co., Niagara Falls, N. Y.
Delta Mfg. Co., Milwaukee
Haskins Co., R. G., Chicago
Jefferson Machine Tool Co., Cincinnati
Mattison Machine Works, Rockford, Ill.
Porter-Cable Mach. Co., Syracuse, N. Y.
Production Mach. Co., Greenfield, Mass.
Rotor Tool Co., Cleveland
Skilsaw, Inc., Chicago
Stow Mfg. Co., Binghamton, N. Y.
Strand Co., N. A., Chicago
Walker-Turner Co., Plainfield, N. J.
Walls Sales Corp., N. Y. C.

SAW BLADE GRINDING FIXTURES
Industrial Engrg. Co., Inc., Minneapolis

SAW BLADES, Circular Metal-Cutting
Atkins & Co., E. C., Indianapolis
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Inc., Detroit
Disston & Sons, Inc., Henry, Tacony, Philadelphia
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland

SAW BLADES, Hack & Band (See **BLADES, Hack & Band-Saw**)

SAWS, Band, Metal-Cutting (Machines)
Armstrong-Blum Mfg. Co., Chicago
Atkins & Co., E. C. Indianapolis
Avey Drilling Mach. Co., Cincinnati
Capewell Mfg. Co., Hartford, Conn.
Continental Machines, Inc., Minneapolis
Delta Mfg. Co., Milwaukee
Kalamazoo Tank & Silo Co., Kalamazoo, Mich.
Peerless Machine Co., Racine, Wis.
Racine Tool & Machine Co., Racine, Wis.
Reed-Prentice Corp., Worcester, Mass.
Ryerson & Son, Inc., Jos. T., Chicago
Starrett Co., L. S., Athol, Mass.
Walker-Turner Co., Plainfield, N. J.

SAWS, Circular, Metal-Cutting (Machines)
Consolidated Mach. Tool Corp., Rochester, N. Y.
Delta Mfg. Co., Milwaukee
Disston & Sons, Inc., Henry, Tacony, Philadelphia
Earle Gear Machine Co., Philadelphia
Motch & Merryweather Co., Cleveland
Porter-McLeod Machine Tool Co., Hatfield, Mass.

SAWS, Circular, Wood-Cutting (Machine)
Atkins & Co., E. C., Indianapolis
Curtis Pneumatic Machy. Co., St. Louis
Delta Mfg. Co., Milwaukee
Disston & Sons, Inc., Henry, Tacony, Philadelphia
Mattison Machine Works, Rockford, Ill.
Walker-Turner Co., Inc., Plainfield, N. J.

SAWS, Friction
Ryerson & Son, Inc., Jos. T., Chicago

SAWS, Hack (See **TOOLS, Hand**)

SAWS, Hole
Armstrong-Blum Co., Chicago
Atkins & Co., E. C., Indianapolis
Avey Drilling Mach. Co., Cincinnati
Black & Decker Mfg. Co., Towson, Md.
Earle Gear & Machine Co., Philadelphia
Schrader's Sons, A., N. Y. C.
Skilsaw, Inc., Chicago

SAWS, Portable (See **TOOLS, Portable**)

SAWS, Power Hack
Armstrong-Blum Mfg. Co., Chicago
Atkins & Co., E. C., Indianapolis
Capewell Mfg. Co., Hartford, Conn.
Covel Mfg. Co., Benton Harbor, Mich.
L-W Chuck Co., Toledo, Ohio
Oster Mfg. Co., Cleveland
Peerless Machine Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Ryerson & Son, Inc., Jos. T., Chicago

SCRAPERS, Beet
Rhoads & Sons, J. E., Philadelphia

SCRAPERS, Hand (See **TOOLS, Hand**)

SCRAPERS, Power
Black & Decker Mfg. Co., Towson, Md.

SCREWDRIVERS, Flexible-Shaft (See **TOOLS, Flexible-Shaft**)

SCREWDRIVERS, Hand (See **TOOLS, Hand**)

SCREWDRIVERS, Portable Electric & Pneumatic (See **TOOLS, Portable**)

SCREWDRIVING & NUT-SETTING MACHINES
Bodine Corp., Bridgeport, Conn.
Haskins Co., R. G., Chicago
Producto Machine Co., Bridgeport, Conn.
Schauer Machine Co., Cincinnati
Strand & Co., N. A., Chicago

SCREW-MACHINES, Automatic
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Mach. Co., Cleveland
Cone Automatic Mach. Co., Windsor, Vt.
Foote-Burt Co., Cleveland
Greenlee Bros. & Co., Rockford, Ill.
National Acme Co., Cleveland
New Britain-Gridley Mach. Div., New Britain, Conn.
Scherr Co., Inc., George, N. Y. C.
Warner & Swasey Co., Cleveland

SCREW-MACHINES, Plain & Hand
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Mach. Co., Cleveland
Gisholt Machine Co., Madison, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
Jones & Lamson Mach. Co., Springfield, Vt.
National Acme Co., Cleveland
Rivett Lathe & Grinder, Inc., Boston
Warner & Swasey Co., Cleveland

SCREW PLATES (See **DIES, Screw-Cutting, Adjustable**)

SCREWS, Cap and Set
Allen Mfg. Co., Hartford, Conn.
Baumbach Mfg. Co., E. A., Chicago
Danly Machine Specialties, Inc., Chicago
Eastern Machine Screw Corp., New Haven, Conn.
National Acme Co., Cleveland
Parker-Kalon Corp., N. Y. C.
Republic Steel Corp., Cleveland, O.
Standard Pressed Steel Co., Jenkintown, Pa.
Strong Carlisle & Hammond Co., Cleveland

SCREWS, Machine
Allen Mfg. Co., Hartford, Conn.
Eastern Machine Screw Corp., New Haven, Conn.
Lamson & Sessions Co., Cleveland
Republic Steel Co., Cleveland
Strong, Carlisle & Hammond Co., Cleveland

SCREWS, Recessed Head
American Screw Co., Providence, R. I.
Central Screw Co., Chicago
Chandler Products Corp., Cleveland
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit
National Screw & Mfg. Co., Cleveland
New England Screw Co., Keene, N. H.
Parker Co., Charles, Meriden, Conn.
Parker-Kalon Corp., N. Y. C.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Mfg. Co., Chicago, Ill.
Phillips Screw Mfrs., Providence, R. I.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Shakeproof Lock Washer Co., Chicago
Southington Hardware Mfg. Co., Southington, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.
Whitney Screw Corp., Nashua, N. H.

SCREWS, Self-Tapping
Parker-Kalon Corp., N. Y. C.

SCREWS, Thumb & Wing
Parker-Kalon Corp., N. Y. C.

SCRIBERS
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

SEALS, Oil
Gits Bros. Mfg. Co., Chicago

SEPARATORS, Centrifugal
Barrett Co., Leon J., Worcester, Mass.
DeLaval Separator Co., N. Y. C.
National Acme Co., Cleveland
Sparkler Mfg. Co., Mundelein, Ill.

SETS, Rivet
American Swiss File & Tool Co., Elizabeth, N. J.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., Cleveland

SETTERS, Nut (See **TOOLS, Portable**)

SHAFTING, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Earle Gear & Mach. Co., Philadelphia
Jones & Laughlin Steel Corp., Pittsburgh
National Tube Co., Pittsburgh
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., Pittsburgh

SHAFTS, Flexible
Dumore Co., Racine, Wis.
Errington Mech. Lab., Stapleton, N. Y.
Haskins Co., R. G., Chicago
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Stow Mfg. Co., Binghamton, N. Y.
Strand Co., N. A., Chicago
Walker-Turner Co., Inc., Plainfield, N. J.

SHAPERS
American Tool Works Co., Cincinnati
Ames Co., B. C., Waltham, Mass.
Atkins & Co., E. C., Indianapolis
Atlas Press Co., Kalamazoo, Mich.
Automotive Maintenance Machinery Co., N. Chicago, Ill.
Bryant Machinery & Engrg. Co., Chicago
Cincinnati Shaper Co., Cincinnati
Hanson-Whitney Mach. Co., Hartford, Conn.
Hendey Machine Co., Torrington, Conn.
Machinery Mfg. Co., Los Angeles
Morey Machinery Co., Inc., N. Y. C.
Ohio Machine Tool Co., Kenton, O.
Pratt & Whitney Div., Niles-Bement-Bond Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
Rockford Mach. Tool Co., Rockford, Ill.
Smith & Mills Co., Cincinnati

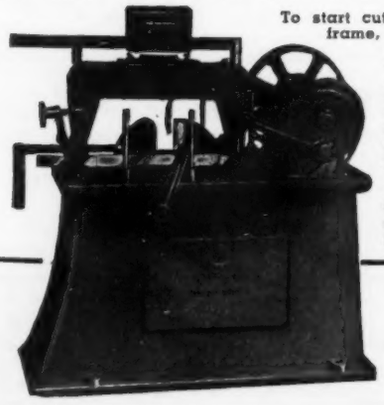
L-W

HIGH SPEED

POWER HACK SAWS

Quality at Low Cost

IMPROVED DESIGN — HEAVY DUTY — FAST CUTTING — A REAL SAW THAT WILL SAVE YOU TIME AND MONEY



To start cut, relieve weight of saw frame, hold down on release lever and lower saw to work — start machine. Automatic trip stops the machine on completion of cut. Automatic relief of saw blade on the non-cutting stroke is also provided.

Capacity 6" x 6" with 10" to 14" blades — Clutch Pulley 12" x 3"— speed of Pulley 120 r.p.m.

Only
$180.15
Motor Drive Arrangement, Less Motor, $24.75 Additional

L-W CHUCK CO.
5 N. ST. CLAIR ST. TOLEDO, OHIO

TWIN-MO
The new high speed steel

KINITE
Alloy Air Hardening Bar Steel & Castings

H. BOKER & CO., Inc., 101 Duane St., New York, N. Y.

WHERE-TO-BUY DIRECTORY

SHARPENERS, Saw
Detroit Tap & Tool Co., Detroit
Ex-Cell-O Corp., Detroit
Fellows Gear Shaper Co., Springfield, Vt.
Michigan Tool Co., Detroit
National Broach & Mach. Co., Detroit
Weldon Tool Co., Cleveland

SHAVING MACHINES
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Gear & Machine Co., Detroit
Michigan Tool Co., Detroit

SHEARS, Hand
Black & Decker Mfg. Co., Towson, Md.
Buffalo Forge Co., Buffalo, N. Y.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Minneapolis

SHEARS, Rotary
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Detroit Tap & Tool Co., Detroit
Disston & Sons, Inc., Henry, Tacony, Philadelphia
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Ryerson & Sons, Inc., Jos. T., Chicago
Schatz Mfg. Co., Poughkeepsie, N. Y.

SHEARS, Squaring
Beatty Mach. & Mfg. Co., Hammond, Ind.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati
Cleveland Crane & Engrg. Co., Wickliffe, O.
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Kent-Owens Machine Co., Toledo, O.
Mitts & Merrill, Saginaw, Mich.
Niagara Mach. & Tool Wkks., Buffalo, N. Y.
Schatz Mfg. Co., Poughkeepsie, N. Y.

SHEAVES, "V" Belt
Allis-Chalmers Mfg. Co., Milwaukee
American Pulley Co., Philadelphia
Dayton Rubber Mfg. Co., Dayton, O.
Dodge Mfg. Corp., Mishawaka, Ind.
Earle Gear & Machine Co., Philadelphia
Gates Rubber Co., Denver, Colo.
Hill Acme Co., Cleveland

SHEET-METAL WORKING MACHINERY (See **BRAKES, Bending Press; DIES, Sheet-Metal; Forming Machines; NIBBLERS; PRESSES; REELS, Stripstock; RIVETERS; ROLLS, Bending; SHEARS; STITCHERS, Metal**)

SHELL-MAKING Machinery
Bullard Co., Bridgeport, Conn.
Colman & Sons, Frederick, Detroit
Hepburn American Co., Greenwich, Conn.
Morey Machinery Co., Inc., N. Y. C.

SHIMS, Bearing, Plain & Laminated
Laminated Shim Co., Glenbrook, Conn.

SHIPPING SERVICE
Railway Express, All Principal Cities

SKIDS (See **TRUCKS, Hand**)

SLEEVES & SOCKETS, Drill
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., Cleveland
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Brothers, Inc., Elmira, N. Y.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

SLOTTERS
Baker Bros., Inc., Toledo, O.
Consolidated Machine Tool Corp., Rochester, N. Y.
Douglas Machinery Co., Inc., N. Y. C.
General Machinery Corp., Hamilton, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

SOCKETS, Drill (See **SLEEVES & SOCKETS, Drill**)

SOLVENTS, Oil & Grease
Detroit Rex Products Co., Detroit
Oakite Products, Inc., N. Y. C.

SPINDLES, Machine
Bryant Chucking Grinder Co., Springfield, Vt.
Dumore Co., Racine, Wis.
Ex-Cell-O Corp., Detroit
Heald Machine Co., Worcester, Mass.
Monarch Machine Tool Co., Sidney, O.
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago

SPRAYERS, Paint
Ideal Commutator Dresser Co., Chicago

SPRINGS, Die
Allen Mfg. Co., Hartford, Conn.
Danly Machine Specialties, Chicago

SPROCKETS (See **GEARS, CUT**)

SQUARES, Precision (See **BLOCKS, Precision Gage**)

STAMPINGS, Metal
Acromark Corp., Elizabeth, N. J.
American Brass Co., Waterbury, Conn.
Continental Machines, Inc., Minneapolis
Revere Copper & Brass Inc., N. Y. C.
Standard Pressed Steel Co., Jenkintown, Pa.
Sundstrand Mach. Tool Co., Rockford, Ill.

STAMPS & HOLDERS, Steel, Safety
Acromark Corp., Elizabeth, N. J.
Noble & Westbrook Mfg. Co., East Hartford, Conn.

STAMPS, Steel (See **DIES, Marking & Embossing**)

STARTERS, Motor (See **CONTROLLERS, Motor**)

STEEL, Die
Allegheny Ludlum Steel Corp., Pittsburgh
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Ryerson & Son, Inc., Jos. T., Chicago
Timken Steel & Tube, Div., Canton, O.
Vanadium Alloys Steel Co., Pittsburgh

STEEL-MILL PRODUCTS
Allegheny-Ludlum Steel Corp., Pittsburgh (Steel and stainless steel sheets, plates, tubes, wire and strip)
American Steel & Wire Co., Cleveland (Cold-finished bars, wire and wire products)
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., Cleveland (Tubing)
Boker & Co., Inc., H., N. Y. C.
Carnegie-Illinois Steel Corp., Pittsburgh
Carpenter Steel Co., Reading, Pa.
Columbia Steel Co., San Francisco
Copperweld Steel Co., Glassport, Pa.
Disston & Sons, Inc., Henry, Philadelphia
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc. Div. Borg-Warner Corp., New Castle, Ind.
Jones & Laughlin Steel Corp., Pittsburgh
Latrobe Elec. Steel Co., Latrobe, Pa.
Republic Steel Corp., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Timken Steel & Tube Div., Canton, O.
Union Drawn Steel Co., Massillon, O. (Cold-finished)
Vanadium Alloys Steel Co., Pittsburgh
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Wyckoff Drawn Steel Co., Pittsburgh

STEEL, Stainless (See preceding classification)

STEEL, Tool
Allegheny- Ludlum Steel Corp., Pittsburgh
Armstrong Bros. Tool Co., Chicago
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., Cleveland
Climax Molybdenum Co., N. Y. C.
Columbia Steel Co., San Francisco
Copperweld Steel Co., Glassport, Pa.
Firth-Sterling Steel Co., Mc Keesport, Pa.
Ingersoll Steel & Disc. Div. Borg-Warner Corp., New Castle, Ind.
Latrobe Elec. Steel Co., Latrobe, Pa.
Republic Steel Corp., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Timken Steel & Tube Div., Canton, O.
United States Steel Corp., Pittsburgh
Vanadium Alloys Steel Co., Pittsburgh
Wheelock, Lovejoy Co., Inc., Cambridge, Mass.

STERILIZERS, Oil
Barrett Co., Leon J., Worcester, Mass.

STOCKS, Dies & Cutters, Pipe
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Oster Mfg. Co., Cleveland
Pratt & Whitney Co., Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Corp., Dayton, O.
Standard Tool Co., Cleveland
Winter Brothers Co., Wrentham, Mass.

STONES, Sharpening
Bay State Abrasive Products Co., Westboro, Mass.
Behr-Manning Corp., Troy, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Midwest Abrasive Co., Detroit

STRAIGHTEDGES (See **DIE-MAKERS' SUPPLIES**)

STRAIGHTENERS, Wire
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Springfield Mach. Tool Co., Springfield, O.
Watson-Stillman Co., Roselle, N. J.

STRAIGHTENING & SIZING MACHINES
Taylor Wilson Mfg. Co., McKees Rocks, Pa.

STRIPPERS, Wire
Ideal Commutator Dresser Co., Chicago

SUB-PRESSES & DIES (See **Dies, Subpress**)

SUPERFINISHING EQUIPMENT
Ultra-Lap Mach. Co., Detroit

SURFACE-BROACHING MACHINES (See **BROACHING MACHINES**)

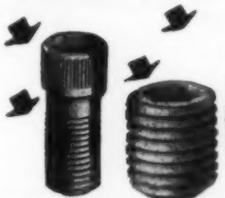
SURFACE PLATES (See **PLATES, Surface**)

SWAGING MACHINES
Etna Machine Co., Toledo
Torrington Co., Torrington, Conn.

SWITCHES, Electric
Adam Electric Co., Frank, St. Louis
Allen-Bradley Co., Milwaukee
Allis-Chalmers Mfg. Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Brown Instrument Co., Philadelphia
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
L-W Chuck Co., Toledo, O.
Square D Co., Milwaukee
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

DANLY *Knurled*



All Die Makers' Supplies
Danly Commercial Sets
Danly Special Sets

SOCKET-HEAD CAP SCREWS
HOLLOW SET SCREWS
DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue, Chicago, Illinois
MILWAUKEE • LONG ISLAND CITY, N. Y.
DAYTON • DETROIT • ROCHESTER
CLEVELAND • PHILADELPHIA
DUCOMMUN METALS & SUPPLY CO.
Los Angeles • San Francisco

DANLY PRECISION DIE SETS

DIE-LESS DUPLICATING

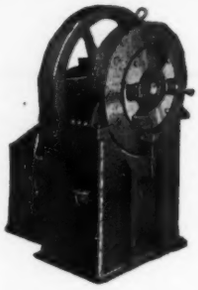
For experimental work, or duplicated parts accurate to .001" in small or large quantities, Man Hours can often be reduced and Critical Materials saved with the DI-ACRO System of "DIE-LESS DUPLICATING".

In illustration, left to right: 1st: DI-ACRO Shear squares and sizes material. 2nd: Brake makes angles, channels, "Vees". 3rd: Bender forms angle, channel, rod, tubing, wire, etc.

Send for catalog "METAL DUPLICATING WITHOUT DIES"

DI-ACRO PRECISION MACHINES

O'NEIL-IRWIN MFG. CO. 311 8th Ave. South Minneapolis, Minn.



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

TO INSTRUCT NEW MEN IN THE HANDLING OF
DIAMOND TOOLS

we will send you a valuable booklet. No charge, no obligation.

KOEBEL DIAMOND TOOL CO.
9345 Grinnell Ave., Detroit

KOEBELITE DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for all Industrial Purposes.

"Ask ETNA about Swaging"

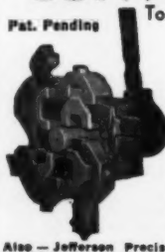
• If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of ⅛" to 4" . . . larger sizes built to order!

Ask for our swaging catalogs

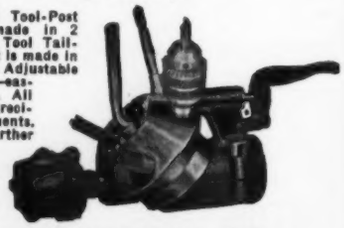
The ETNA MACHINE Co.
3400 MAPLEWOOD AVE. TOLEDO, OHIO

DON'T WAIT FOR TURRET LATHES
CONVERT YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS
To fit Bench lathes and lathes up to 24" swing.
Designed to increase production.
6 days delivery.

Pat. Pending



The 4 Tool Tool-Post Turret is made in 2 sizes. The 5 Tool Tail-Stock Turret is made in 4 sizes. Also Adjustable Full Feed—easily attached. All tools are precision attachments. Write for further details.



Also — Jefferson Precision Milling Machines, Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles.

JEFFERSON MACHINE TOOL CO.
So. Sweeney, Cutter & Fourth Sts. Cincinnati, Ohio

WHERE-TO-BUY DIRECTORY

SWITCHES, Limit
Allen-Bradley Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
National Acme Co., Cleveland
Square D Co., Milwaukee
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

SYSTEMS, Production & Tool Control
McCaskey Register Co., Alliance, O.
Visible Index Corp., N. Y. C.

TABLES, Elevating Portable
Hamilton Tool Co., Hamilton, O.

TACHOMETERS (See INDICATORS, Speed)

TANKS & CYLINDERS, Air
Anker Holth Mfg. Co. (Airgrip Chuck Div.) Port Huron, Mich.
Clearing Machine Corp., Chicago
Curtis Pneu. Machinery Co., St., Louis
National Tube Co., Pittsburgh
Tomkins-Johnson Co., Jackson, Mich.

TAPER PINS (See PINS, Dowel & Taper)

TAPES, Measuring
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

TAPPERS, Single & Multi-Spindle
Armstrong-Blum Mfg. Co., Chicago
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Baker Bros., Inc., Toledo, O.
Barber-Colman Co., Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Barnes Co., W. F. & John, Rockford, Ill.
Bodine Corp., Bridgeport, Conn.
Bradford Mach. Tool Co., Cincinnati
Buffalo Forge Co., Buffalo, N. Y.
Buhr Mach. Tool Co., Ann Arbor, Mich.
Bullard Co., Bridgeport, Conn.
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati-Gilbert Machine Tool Co., Cincinnati
Delta Mfg. Co., Milwaukee
Ettco Tool Co., Brooklyn, N. Y.
Foote-Burt Co., Cleveland
Geometric Tool Co., New Haven, Conn.
Goss & deLeeuw Machine Co., New Britain, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Haskins Co., R. G. Chicago
Hill Acme Co., Cleveland
Kingsbury Mach. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
Murchey Mach. & Tool Co., Detroit
National Acme Co., Cleveland
National Auto Tool Co., Richmond, Ind.
Rickert-Shafer Co., Erie, Pa.
Snyder Tool & Engrg. Co., Detroit

TAPS, Adjustable (See DIES, Adjustable)

TAPS, Hand & Machine, Solid
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Detroit Tap & Tool Co., Detroit
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Machine Co., Hartford, Conn.
Landis Machine Co., Waynesboro, Pa.
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Standard Tool Co., Cleveland
Threadwell Tap & Die Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Winter Brothers Co., Wrentham, Mass.
Wood & Spencer Co., Cleveland

TESTING EQUIPMENT, Tension & Compression
Baldwin-Southwark Corp., Philadelphia
Hartford Special Machinery Co., Hartford, Conn.
Hydraulic Press Mfg. Co., Mt. Gilead, O.

THREADING MACHINES, Die-Head
Brown & Sharpe Mfg. Co., Providence, R. I.
Dalzen Tool & Mfg. Co., Detroit
Eastern Mach. Screw Corp., New Haven, Conn.
Ex-Cell-O Corp., Detroit
Geometric Tool Co., New Haven, Conn.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., Cleveland
Lees-Bradner Co., Cleveland
Murchey Machine & Tool Co., Detroit
Oster Mfg. Co., Cleveland
Rickert-Shafer Co., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waltham Mach. Wks., Waltham, Mass.
Warner & Swasey Co., Cleveland

THREADING MACHINES, Roll
Brown & Sharpe Mfg. Co., Privodence, R. I.
Hill Acme Co., Cleveland
V. & O. Press Co., Hudson, N. Y.

THERMOMETERS, Dial
Brown Instrument Co., Philadelphia
Strong, Carlisle & Hammond Co., Cleveland

TOOL HOLDERS (See HOLDERS, Tool)

TOOL POSTS, Lathe
Armstrong Bros. Tool Co., Chicago
Colonial Broach Co., Detroit
Detroit Tap & Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Boring
Armstrong Bros. Tool Co., Chicago
Bullard Co., Bridgeport, Conn.
Carboloy Co., Detroit, Mich.
Cincinnati Lathe & Tool Co., Cincinnati
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Genesee Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Heald Machine Co., Worcester, Mass
Illinois Tool Works, Chicago
Lucas Machine Tool Co., Cleveland
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
National Tool Co., Cleveland
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Ready Tool Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Sturdimatic Tool Co., Detroit
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vasceloy-Ramet Corp., N. Chicago, Ill.
Warner & Swasey Co., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

TOOLS and PARTS, Cemented-Carbide
Armstrong Bros. Tool Co., Chicago
Barber-Colman Co., Rockford, Ill.
Carbide Tool Co., Chicago
Carboloy Co., Inc., Detroit
Crafts Co., Inc., Arthur A., Boston
Detroit Tap & Tool Co., Detroit
Disston and Sons, Inc., Henry, Tacony, Philadelphia
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Grayson Mfg. Co., Monrovia, Cal.
Illinois Tool Works, Chicago
McKenna Metals Co., Latrobe, Pa.
Metal Carbides Corp., Youngstown, O.
Michigan Tool Co., Detroit

LUERS Patented Cut Off Tool Holders
Patented Cut Off Blades : : :
MANUFACTURED BY
12 Pine Street · J. MILTON LUERS · Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

WHERE-TO-BUY DIRECTORY

Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Sheffield Corp., Dayton, O.
Tungsten Elec. Corp., Union City, N. J.
Vanadium Alloys Steel Co., Pittsburgh
Vascoloy-Ramet Corp., Chicago
Warner & Swasey Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Diamond-Tipped
Crafts Co., Arthur A., Boston
Desmond-Stephan Mfg. Co., Urbana, O.
Diamond Tool Co., Chicago
Gorton Machine Co., Geo., Racine, Wis.
Kent-Owens Machine Co., Toledo, O.
Koebel Diamond Tool Co., Detroit
Norton Company, Worcester, Mass.
Smit & Son, J. K., N. Y. C.

TOOLS, Flexible-Shaft
Dumore Co., Racine, Wis.
Haskins Co., R. G., Chicago
Ideal Commutator Dresser Co., Chicago
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Stow Mfg. Co., Binghamton, N. Y.
Strand & Co., N. A., Chicago
Walker-Turner, Inc., Plainfield, N. J.

TOOLS, Hand
Allen Mfg. Co., Hartford, Conn.
American Swiss File & Tool Co., Elizabeth, N. J.
Armstrong-Blum Mfg. Co., Chicago
Armstrong Bros. Tool Co., Chicago
Atkins & Co., F. C., Indianapolis
Automotive Maintenance Machy. Co., No. Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Butterfield & Co., Derby Line, Vt.
Capewell Mfg. Co., Hartford, Conn.
Carboloy Co., Detroit
Card Mfg. Co., S. W., Mansfield, Mass.
Cleveland Punch & Shear Works Co., Cleveland
Cleveland Twist Drill Co., Cleveland
Crafts Co., Arthur A., Boston
Dearborn Gage Co., Dearborn, Mich.
Disston & Sons, Inc., Henry, Philadelphia
Elastic Stop Nut Corp., Union, N. J.
Errington Mech. Lab., Stapleton, N. Y.
Gairing Tool Co., Detroit
Greene, Tweed & Co., N. Y. C.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hamilton Tool Co., Hamilton, O.
Lufkin Rule Co., Saginaw, Mich.
National Twist Drill & Tool Co., Detroit
Niagara Mach. & Tool Wks., Buffalo, N. Y.
North Bros. Mfg. Co., Philadelphia
Numberall Stamp & Tool Co., Hugenot Park, N. Y.
Plomb Tool Co., Los Angeles
Pratt & Whitney Div., Niles-Bement-Pond, Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Racine Tool & Mach. Co., Racine, Wis.
Scully-Jones & Co., Chicago
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Clevelard
Thompson & Son Co., Henry G., New Haven, Conn.
Union Twist Drill Co., Athol, Mass.
Victor Saw Works, Inc., Middletown, N. Y.
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Knurling (See KNURLS & KNURL HOLDERS)

TOOLS, Lathe, Shaper and Planer
American Tool Works Co., Cincinnati
Armstrong Bros. Tool Co., Chicago
Atlas Press Co., Kalamazoo, Mich.
Auto Ordnance Corp., Bridgeport, Conn.
Blake Co., Edward, Newton Centre, Mass.
Bullard Co., Bridgeport, Conn.
Carboloy Co., Detroit
Cincinnati Lathe & Tool Co., Cincinnati
Cleveland Twist Drill Co., Cleveland
Colonial Broach Co., Detroit
Empire Tool Co., Detroit
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Genesee Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Hendey Machine Co., Torrington, Conn.
Illinois Tool Works, Chicago
Jefferson Mach. Tool Co., Cincinnati
LeBlond Mach. Tool Co., R. K., Cincinnati
Luers, J. Milton, Mt. Clemens, Mich.
McKenna Metals Co., Latrobe, Pa.
Michigan Tool Co., Detroit
National Broach & Machine Co., Detroit
National Tool Co., Cleveland
Nobur Mfg. Co., Los Angeles
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Ready Tool Co., Bridgeport, Conn.
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago
Starrett Co., L. S., Athol, Mass.
Sturdimatic Tool Co., Detroit
Vascoloy-Ramet Corp., N. Chicago, Ill.
Warner & Swasey Co., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Portable Electric
Black & Decker Mfg. Co., Towson, Md.
Chicago Wheel & Mfg Co., Chicago
Delta Mfg. Co., Milwaukee
Dremel Mfg. Co., Racine, Wis.
Dumore Co., Racine, Wis.
Hisey-Wolf Machine Machine Co., Cincinnati
Rotor Tool Co., Cleveland
Schauer Machine Co., Cincinnati
Skilsaw, Inc., Chicago
Walker-Turner Co., Plainfield, N. J.

TOOLS, Portable Pneumatic
Cleveland Pneu Tool Co., Cleveland
Onsrud Machine Works, Inc.,
Rotor Tool Co., Cleveland
Sheldon Machine Co., Chicago

TOOLS, Stellite
Haynes, Stellite Co., N. Y. C.

TORCHES, Gas-Cutting & Welding
Air Reduction, N. Y. C.

TRANSMISSIONS, Gear-Shift Type
Drive-All Mfg. Co., Detroit

TRANSMISSIONS, Hydraulic
Barnes Co., W. F. John, Rockford, Ill.
Elmes Engrg. Wks., Chas. F., Chicago
Ex-Cell-O Corp., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.
Vickers, Inc., Detroit

TRANSMISSIONS, Mech. Variable-Speed
Adams Co., Dubuque, Iowa
Allis-Chalmers Mfg. Co., Milwaukee
Continental Machine, Inc., Minneapolis
Earle Gear & Machine Co., Philadelphia
Ideal Commutator Dresser Co., Chicago
Morse Chain Co., Ithaca, N. Y.
Reeves Pulley Co., Columbus, Ind.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

TROLLEYS, TRACKS & TRAMWAYS, Overhead
American Steel & Wire Co., Cleveland
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Cleveland Crane & Engineering Co., Wickliffe, O.
Cullen-Friestedt Co., Chicago
Curtis Pneu. Machinery Co., St. Louis
Ford Chain Block Div. Am. Chain & Cable Co., Inc., Philadelphia, Pa.
Harnischfeger Corp., Milwaukee
Mathews Conveyor Co., Ellwood City, Pa.
Standard Conveyor Co., No. St. Paul, Minn.
Wright Mfg. Div. Am. Chain & Cable Co., Inc., York, Pa.

TRUCKS, Hand
Standard Pressed Steel Co., Jenkintown, Pa.

Write for details on 5-METHOD TOOL SERVICE

Vascoloy RAMET

TANTALUM-TUNGSTEN CARBIDE
CUTTING TOOLS—DRAWING DIES
TANTUNG "G" CUTTING TOOLS

4238

VASCOLOY-RAMET CORPORATION
NORTH CHICAGO, ILLINOIS

SECOMET Resinoid Bonded Diamond Wheels can do your work more accurately, faster and without appreciable wear. They are most economical for sharpening cemented carbide and multi-bladed tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation. Catalog on request.

Prompt deliveries

J. K. SMIT & SONS, INC.
157 Chambers Street, New York

Single-Point
DIAMOND•TOOLS

While octahedron diamonds give entire satisfaction for truing and dressing of most grinding wheels, "Ready-Set" Diamond Tools, containing an elongated stone that may be completely consumed without resetting, may be profitably used on certain operations. Catalog on request.

J. K. SMIT & SONS, INC.
157 Chambers Street, New York

WHERE-TO-BUY DIRECTORY

TUBING, Steel
Bissett Steel Co., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
Timken Steel & Tube Co., Canton, Ohio

TURRETS, Tool-post & Tailstock
Gisholt Machine Co., Madison, Wis.
Jefferson Machine Tool Co., Cincinnati
McCrosky Tool Corp., Meadville, Pa.
Warner & Swasey Co., Cleveland

UNITS, Drilling, Reaming & Tapping
Barnes Co., W. F., & John, Rockford, Ill
Kingsbury Mach. Tool Corp., Keene, N. H.

UPSETTERS (See Forging Machines)

USED MACHINERY (See Searchlight Section)

V BLOCKS (See Blocks, V)

VALVES, Air-Control
Atkins & Co., E. C., Indianapolis
Barber-Colman Co., Rockford, Ill.
Curtis Pneumatic Machinery Co., St. Louis
Littell Machine Co., F. J., Chicago
Nicholson & Co., W. H. Wilkes-Barre, Pa.
Ross Operating Valve Co., Detroit
Schrader's Son, A., Brooklyn, N. Y.
Tomkins-Johnson Co., Jackson, Mich.

VALVES, Hydraulic
Baldwin-Southwark Corp., Philadelphia
Barnes Co., W. F. & John, Rockford, Ill.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Elmes Engrg. Wks., Chas. F., Chicago
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Racine Tool & Mach. Co., Racine, Wis.
Sundstrand Mach. Tool Co., Rockford, Ill.
Vickers, Inc., Detroit
Watson-Stillman Co. Roselle, N. J.

VERNIERS
Brown & Sharpe Mfg. Co., Providence, R. I.

VISES, Air-Operated
Ross Operating Valve Co., Detroit
Tomkins-Johnson Co., Jackson, Mich.

VISES, Machine
Armstrong Bros. Tool Co., Chicago
Atlas Press Co., Kalamazoo, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago Wheel & Mfg. Co., Chicago
Cincinnati Milling Mach. Co., Cincinnati
Cincinnati Planer Co., Cincinnati
Cincinnati Shaper Co., Cincinnati
Covel Mfg. Co., Benton Harbor, Mich.
Desmond-Stephan Mfg. Co., Urbana, O.
Fenn Mfg. Co., Hartford, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hartford Special Machinery Co., Hartford, Conn.
Hendey Machine Co., Torrington, Conn.
Jefferson Mach. Tool Co., Cincinnati
Johnson Tool Co., E. Providence, R. I.
Kearney & Trecker Corn., Milwaukee
Knight Mach. Co., W. B., St. Louis
L-W Chuck Co., Toledo, O.
North Bros. Mfg. Co., Philadelphia
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Stevens Inc., John B., N. Y. C.

VISES, Machinists' Bench
Atlas Press Co., Kalamazoo, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati
Desmond-Stephan Mfg. Co., Nrban, O.
Fenn Mfg. Co., Hartford, Conn.
Fray Machine Tool Co., Glendale, Calif.
Jefferson Mach. Tool Co., Cincinnati
New Britain-Gridley Machine Co., New Britain, Conn. (Stands)
North Bros. Mfg. Co., Philadelphia
Wiedemann Machine Co., Philadelphia

VISES, Pipe
Armstrong Bros. Tool Co., Chicago
Desmond-Stephan Mfg. Co., Urban, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

WASHERS, Lock
National Lock Washer Co., Newark, N. J.

WASHING & DRYING. Machines (See METAL-CLEANING EQUIPMENT)

WELDERS, Arc
Air Reduction, N. Y. C.
Allis-Chalmers Mfg. Co., Milwaukee
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., Milwaukee
Hobart Bros. Co., Troy, O.
Lincoln Electric Co., Cleveland
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

WELDERS, Resistance
Ohio Machine Tool Co., Kenton, O.

WELDERS, Spot
Ohio Machine Tool Co., Kenton, O.
Progressive Welder Co., Detroit

WELDING ACCESSORIES
Clark Controller Co., Cleveland
Cullen-Friestedt Co., Chicago
Lincoln Electric Co., Cleveland
Mallory & Co., Inc., P. R., Indianapolis (Electrode Holders)

WELDING CONTROLS
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland

WELDING EQUIPMENT
Bavard & Co., Inc., M. L., Philadelphia
General Electric Co., Schenectady, N. Y.

WELDING POSITIONERS
Cullen-Friestedt Co., Chicago
Ransome Machry. Co., Dunellen, N. J.

WELDING RODS
Air Reduction, N. Y. C.
Allegheny-Ludlum Steel Corp., Pittsburgh
Aluminum Co. of America, Pittsburgh
American Brass Co., Waterbury, Conn.
American Steel & Wire Co., Cleveland
Atkins & Co., E. C., Indianapolis
Harnischfeger Corp., Milwaukee
Haynes Stellite Co., N. Y. C.
Hobart Bros. Co., Troy, O.
Lincoln Electric Co., Cleveland
McKay Co., Pittsburgh
Page Steel & Wire Div., Am. Chain & Cable Co., Monessen, Pa.
Revere Copper & Brass Corp., N. Y. C.
Roebling's Sons Co., John A., Trenton, N. J.
Ryerson & Son, Inc., Jos. T., Chicago
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

WELDING TIMERS
Lincoln Electric Co., Cleveland

WELDING TIPS
Mallory & Co., Inc., P. R., Indianapolis

WHEELS, Grinding & Polishing
Bakelite Corp., N. Y. C.
Bay State Abrasive Products Co., Westboro, Mass.
Blanchard Mach. Co., Cambridge, Mass.
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Carborundum Co., Niagara Falls, N. Y.
Chicago Wheel & Mfg. Co., Chicago
Cincinnati Milling Mach. Co., Cincinnati
deSanno & Son Inc., A. P., Phoenixville, Pa.
Gardner Machine Co., Beloit, Wis.
Macklin Co., Jackson, Mich.
Midwest Abrasive Co., Detroit
Norton Co., Worcester, Mass.
Porter-Cable Mach. Co., Syracuse, N. Y.
Roberts Rubber Co., Weldon, Newark, N. J.
Sterling Grinding Wheel Co., Tiffin, O.
Vitrified Wheel Co., Westfield, Mass.

WINDERS, Coil
Ideal Commutator Dresser Co., Chicago

WIPING CLOTHS
Burcott Mills, Chicago

WIRE, Spring
American Brass Co., Waterbury, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh
Page Steel & Wire Div. Amer. Chain & Cable Co., Inc., Monessen, Pa.
Revere Copper & Brass Inc., N. Y. C.

WIRES, Measuring
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Van Keuren Co., Watertown, Mass.

WOODWORKING MACHINERY
Barnes Co., W. F. & John, Rockford, Ill.
Capewell Mfg. Co., Hartford, Conn.
Delta Mfg. Co., Milwaukee
Diehl Machine Works, G. M., Wabash, Ind.
Greenlee Bros. & Co., Rockford, Ill.
Jefferson Mach. Tool Co., Cincinnati
Mattison Machine Works, Rockford, Ill.
Walker-Turner Co., Plainfield, N. J.

WRENCHES, Open End
Armstrong Bros. Tool Co., Chicago
Plomb Tool Co., Los Angeles
Williams & Co., J. H., Buffalo, N. Y.

WRENCHES, Pipe
Armstrong Bros. Tool Co., Chicago
Standard Tool Co., Cleveland
Williams & Co., J. H., Buffalo, N. Y.

WRENCHES, Ratchet
Allen Mfg. Co., Hartford, Conn.
North Bros. Mfg. Co., Philadelphia
Williams, J. H. & Co., Buffalo, N. Y.

WRENCHES, Socket
Armstrong Bros. Tool Co., Chicago
Greene, Tweed & Co., N. Y. C.
Plomb Tool Co., Los Angeles
Williams & Co., J. H., Buffalo, N. Y.

WRENCHES, Tap
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Errington Mech. Lab., Stapleton, N. Y.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Williams & Co., J. H., Buffalo, N. Y.

Only ONE Wrench has all these Features
Fits two sizes of nuts
Does not chew nuts
Tightens nuts quicker
Cannot slip off nuts
Instantly reversible
Operates in narrow spaces
Can be used over long studs

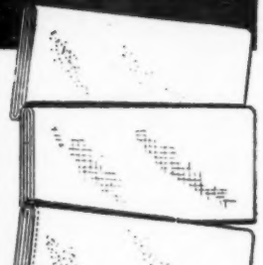
Three sizes of handles, each handle takes five different heads; each head fits two different size nuts. Write for circular and prices.

Carried by leading mill supply houses.

Greene, Tweed & Co.
Bronx Blvd. at 238 St.
New York

FAVORITE * REG. U.S. PAT. OFF.
Reversible Ratchet Wrench

WIPING CLOTHS, CHEESECLOTHS, AND TOWELS TO LICK ANY CLEANING JOB YOU'VE GOT!



Every cleaning job you have requires a special wiping cloth. BURCOTT's selection of wipers and towels includes the exact wiper you need. Not just cheap wiping rags you use once and throw away, but soft absorbent top-quality materials you launder and use over and over again. Discover the economies of BURCOTT's specialized wipers and towels used by war industries all over America. Send for FREE samples and prices of the wipers or towels you need —no agent will call.

BURCOTT MILLS
620-D6 West Fulton St. Chicago, Illinois

Step up production with HOBART
***"Simplified"* arc welding**
Get the facts on today's greatest speed-up tool. Write
Hobart Bros., Box A. M. 8-6 Troy, O.
"One of the world's Largest Builders of Arc Welders and Equipment"

ADVERTISERS INDEX

	Page
Abrasive Machine Tool Co.	258
Acheson Colloids Corp.	101
Acromark Corp.	264
Adams Company	140
Ad-Nalysis	88, 89
Allegheny Ludlum Steel Corp. (Ed.)	1460
Allen Manufacturing Co.	170
Allis-Chalmers Mfg. Co.	22, 23
Aluminum Co. of America	117
American Brake Shoe & Foundry Co.	116
American Chain & Cable Co. Inc.	130
American Cutter & Engineering Corp.	232
American Optical Co.	199
American Screw Co.	92
American Swiss File & Tool Co.	152
American Tool Works Co.	16
Ames Co., B. C.	130
Anker-Holth Mfg. Co.	146
Armstrong-Blum Mfg. Co.	60
Armstrong Bros. Tool Co.	17
Arter Grinding Machine Co.	202
Atlantic Machinery Corp.	259, 264
Atometric Precision Gage Laboratories, Inc.	248
Auto-Ordnance Corp.	37, 176
Avey Drilling Machine Co., Inc.	207
Aviation	112, 113
Axelson Mfg. Co.	180
Ball & Roller Bearing Co.	248
Bantam Bearings Corp.	160
Barber-Colman Co.	50
Bardons & Oliver Inc.	62
Barnes Drill Co.	255
Barrett Co., Leon J.	128
Baumbach Mfg. Co., E. A.	251
Bearings Co. of America	166
Beatty Machine & Mfg. Co.	232
Bethlehem Steel Co.	109
Bilgram Gear & Machine Works	142
Bissett Steel Co.	148
Black & Decker Mfg. Co.	107
Blake Co., Edward	188
Blanchard Machine Co.	42
Blount Co., J. G.	200
Boker & Co. Inc., H.	268
Braun Gear Co.	138
Breuer Elec. Mfg. Co.	256
Bridgeport Safety Emery Wheel Co.	253
Bristol Co.	92
Brown & Sharpe Mfg. Co.	157
Bryant Chucking Grinder Co.	18, 19
Buffalo Forge Co.	224
Buhr Machine Tool Co.	210
Bullard Company	51
Burcott Mills	272
Burke Machine Tool Co.	262
Carbide Tool Co.	167
Carboly Co. Inc. (Ed.)	1463
Carborundum Co.	194
Card Mfg. Co., S.W. (Div. of Union Twist Drill)	202
Carlton Machine Tool Co.	256
Carpenter Steel Co.	30, 31
Center Scope Instrument Co.	124
Central Screw Co.	92
Century Electric Co.	159
Chandler Products Corp.	92
Chicago Metal Hose Corp.	149
Chicago Wheel & Mfg. Co. (Ed.)	1481
Cincinnati Bickford Tool Co.	83
Cincinnati Gear Company	142
Cincinnati Grinders, Incorporated	10, 11
Cincinnati Lathe & Tool Co.	263
Cincinnati Milling Machine Co.	4, 5
Cincinnati Planer Co.	64
Cities Service Oil Co.	99
Clearing Machine Corp.	73
Clemson Bros. Inc.	186
Cleveland Automatic Machine Co.	40, 41
Cleveland Crane & Engineering Co.	227
Cleveland Hobbing Machine Co. (Ed.)	1477
Cleveland Planer, The	225
Cleveland Twist Drill Co.	211
Climax Molybdenum Co.	125
Comtor Co.	256
Cone Automatic Machine Co. Inc.	27
Consolidated Machine Tool Corp.	49, 79
Continental Machines Inc.	77
Continental Screw Co.	92
Copperweld Steel Co.	131
Corbin Screw Corp.	92
Coulter Machine Co., James	220
Covel Mfg. Co.	32
Crafts & Co. Inc., Arthur A.	254
Criterion Machines Works	248
Cullen-Friestedt Co.	116
Danly Machine Specialties, Inc.	269
Davis Keyseater Co.	260
Dearborn Gage Co.	147
Deepfreeze Div. Motor Products Corp.	105
Delta Mfg. Co.	204
Denison Engineering Co.	56, 57
de Sanno & Son, Inc., A.	103, 104
Desmond-Stephan Mfg. Co.	198
Despatch Oven Co.	128
Detroit Bevel Gear Co.	142
Detroit Rex Products Co.	98
DeVlieg Machine Co.	36
Detroit Universal Duplicator Co.	39
Diamond Tool Co.	255
Distic Mfg. Co.	198
Dixon Crucible Co., Joseph	126
DoAll Co. (Ed.)	1484
Douglas Machinery Co.	265
Dremel Mfg. Co.	134
Dykem Co.	249
Earle Gear & Machine Co.	144
Eastern Machine Screw Corp.	190
Elastic Stop Nut Corp.	120
Ericsson Screw Machine Products Company, Inc.	188
Errington Mechanical Laboratory	222
Etna Machine Co.	270
Ettco Tool Co.	228
Executone, Inc.	252
Experimental Tool & Die Co.	247
Fafnir Bearing Co.	121, 122
Fairfield Mfg. Co.	138
Federal Press Co.	208
Fellows Gear Shaper Co.	8, 9
Fenn Mfg. Co.	76
Ferracute Machine Co.	229
Firth-Sterling Steel Co.	34, 35
Fluer-O-Lier Manufacturers	108
Foote Bros. Gear & Machine	141
Ford Chain Block Div. American Chain & Cable Co., Inc.	130
Fosdick Machine Tool Co.	55
Fray Machine Tool Co.	264
Gallmeyer & Livingston Co.	197
Ganschow Gear Co.	138
Gardner Machine Co.	201
Gear Specialties, Inc.	138
General Electric Co.	46, 47
General Machinery Corp. (Mass.)	258
General Machinery Corp. (Ohio)	54
Genesee Tool Co. (Ed.)	1471
Geometric Tool Co.	254
Gerotor May Div. May Oil Turner Corp.	171
Gilbert & Barker Mfg. Co., Associate of Standard Oil Co. of N. J.	154
Gisholt Machine Co.	63, 80
Gits Bros. Mfg. Co.	263
Gleason Works	3
Gorton Machine Co., George	213
Goss & de Leeuw Machine Co.	184
Granite State Machine Co., Inc.	260
Grant Gear Works	142
Grant Mfg. & Machine Co.	267
Gray-Mills Co.	173
Grayson Mfg. Co.	153
Greene, Tweed & Co.	272
Greenfield Tap & Die Corp.	209
Hall Planetary Co.	226
Hamilton Tool Co.	255
Hardinge Brothers, Inc.	43
Harnischfeger Corp.	132
Hartford Special Machinery Co.	140, 210
Haskins Co., R. G.	228
Haynes Stellite Co.	189
Heald Machine Co.	2nd Cover
Hobart Bros. Co.	272
Holman Reamer Co.	267
Hones, Inc., Charles A.	124
Horton & Son Co., E.	58
Ideal Commutator Dresser Co.	186
Illinois Tool Works	183
International Machine Tool Corp.	179
International Screw Co.	92
Jansson Gage Co.	249
Jefferson Machine Tool Co.	270
Johnson Bronze Co.	156
Johnson Machine Co., Carlyle	144
Johnson Tool Co., Inc.	264
Jones & Lamson Machine Co.	6, 7
(Ed.)	1465
Kalamazoo Tank & Silo Co. (Machine Tool Div.)	232
Kearney & Trecker Corp.	20, 21
Kempsmith Machine Co.	29
Kent-Owens Machine Co.	215
Kingsbury Machine Tool Co.	52
Knight Machinery Co., W. B.	265
Koebel Diamond Tool Co.	270
L. W. Chuck Co.	268
The Lamson & Sessions Co.	92
Landis Machine Co.	14, 15
Landis Tool Co.	38
Leach Machinery Co., H.	59
LeBlond Machine Tool Co., R. K.	33
Lees-Bradner Co.	70
Leland-Gifford Co.	254
Liberty Planers, Inc.	219
Lincoln Park Tool & Gage Co.	195
Lindberg Engineering Co.	161
Linley Brothers	261
Lipe-Rollway Corp.	177
Littell Machine Co., F. J.	266
Lodge & Shipley Machine Tool Co.	231
Lombard Governor Corp.	152
Lovejoy Tool Co., Inc.	217
Lucas Machine Tool Co.	249
Luers, J. Milton	270
McCaskey Register Co.	106
McGraw-Hill Book Co., Inc.	132, 154, 172, 187

ADVERTISERS INDEX

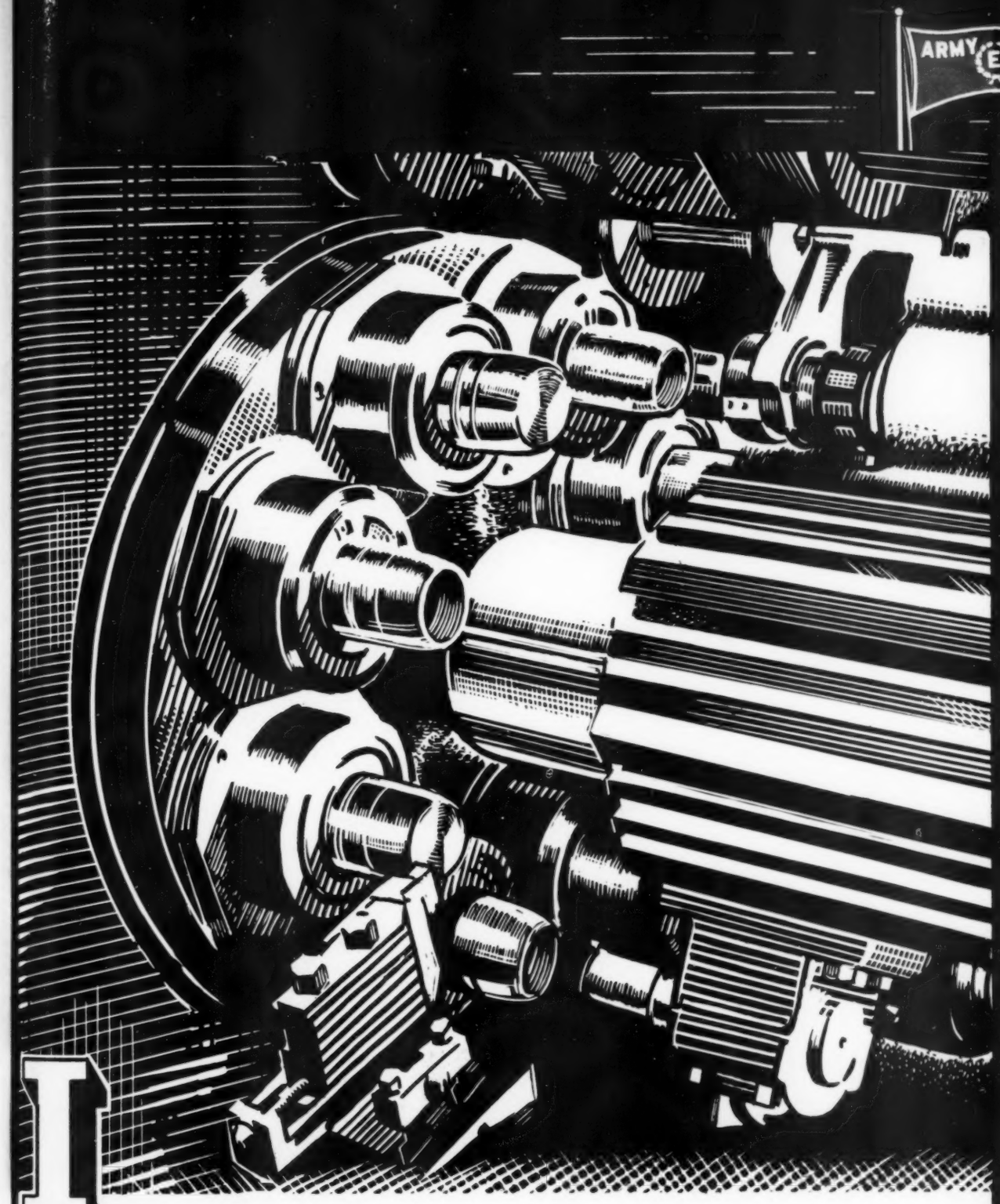
(Continued from preceding page)

	Page
McKenna Metals Co.	222
Machinery Mfg. Co.	218
Macklin Co.	196
Mallory & Co. Inc., P. R.	100
Meisel Press Mfg. Co.	142
Mid-West Abrasive Co.	71
Mitts & Merrill	260
Modern Tool Works	82, 212
Mollart Engineering Co., Ltd.	145
Monarch Machine Tool Co.	24, 25
Morey Machinery Co., Inc.	120, 144, 198
Morris, Ltd., B. O.	178
Morris Machine Tool Co.	86
Morse Chain Co.	163
Morse Twist Drill & Machine Co.	214
Murchey Machine & Tool Co.	221
National Acme Co.	114, 115
National Broach & Machine Co.	165
National Lock Washer Co.	127
National Machine Tool Co.	253
National Refining Co.	133
National Screw & Mfg. Co.	92
Newark Gear Cutting Machine Co.	138
New Britain-Gridley Div. New Britain Machine Co.	3rd Cover
New England Screw Co.	92
Niagara Machine & Tool Works	216
Nichols & Sons, W. H.	218
Nicholson File Co.	96
Nicholson & Co., W. H.	263
Nilson Machine Co., A. H.	224
Norton Co.	74, 75
Numberall Stamp & Tool Co.	262
Oakite Products Inc.	119
Ohio Gear Co.	143
Ohio Machine Tool Co.	72
Ohio Oil Co., Inc.	123
Oliver Instrument Co.	254
O'Neil-Irwin Mfg. Co.	269
Oslund Tool & Die Co.	260
Oster Mfg. Co.	191
Parker Co., Charles	92
Parker-Kalon Corp.	92, 174
Pawtucket Screw Co.	92
Perfex Gage & Tool Co.	150
Pheoll Manufacturing Co.	92
Philadelphia Gear Works	139
Phillips Screw Mfgrs.	92
Porter-McLeod Machine Tool Co., Inc.	220
Potter & Johnston Machine Co.	69
Pratt & Whitney Div. Niles-Bement Pond Co.	81
Production Machine Co.	258
Racine Tool & Machine Co.	233
Railway Express Agency, Inc.	134
Randall & Stickney	257
Ransome Machinery Co.	118
Ready Tool Co.	251
Reed-Prentice Corp.	223
Refiners Lubricating Co.	257
Revere Copper & Brass Inc. (Ed.)	1475
Rhoads & Sons, J. E.	166
Rhode Island Tool Co.	172
Rickert-Shafer Co.	254
Rivett Lathe & Grinder, Inc.	53
Roebling's Sons Co., John W.	87
Roller Bearing Co. of America	158
Rotor Tool Co.	97
Russell, Burdsall & Ward Bolt & Nut Co.	92
Ruthman Machinery Co.	267
Ryerson Sons, Inc., Jos. T. (Ed.)	1479
Savage Tool Co. (Ed.)	1478
Schatz Mfg. Co.	162
Scherr Co., George	182
Scovill Manufacturing Co.	92
Schultz & Anderson Co.	95
Scully Steel Products Co.	129
Sellers & Co., Wm.	102
Seneca Falls Machine Co.	193
Shakeproof, Inc.	92
Sheldon Machine Co.	222
Shore Instrument & Mfg. Co., Inc.	260
Sibley Machine & Foundry Corp.	151
Sier-Bath Gear Co., Inc.	140
Simmons Machine Tool Corp.	190
Smallpeice, Ltd.	226
Smit & Sons, Inc., J. K.	271
Smith and Mills Co.	269
Smith Tool & Engineering Co.	265
South Bend Lathe Works	78
Southington Hardware Mfg. Co.	92
Sparkler Mfg. Co.	118
Sparks Machine Tool Corp.	61
Spencer Thermostat Co.	164
Springfield Machine Tool Co.	262
Stahl Gear Co.	144
Standard Conveyor Co. (Ed.)	1483
Standard Gage Co. Inc.	45
Standard Oil Co. (Indiana)	93, 94
Standard Pressed Steel Co.	168
Standard Tool Co.	206
Stark Tool Co.	135
Steelweld Machinery Div. Cleveland Crane & Engrg. Co.	227
Sterling Grinding Wheel Div.	192
Stevens, Inc., John B.	251
Stokerunit Corp.	203
Strong Carlisle & Hammond Co.	176
Stuart Oil Co., D. A. (Ed.)	1482
Sturdimatic Tool Co.	251
Sun Oil Co. (Ed.)	1467
Taylor-Wilson Mfg. Co.	230
Texas Co.	90
Threadwell Tap & Die Co.	175
Tide Water Associated Oil Co.	110, 111
Timken Roller Bearing Co.	4th Cover
Steel & Tube Div.	155
Tomkins-Johnson Co.	148
Torrington Co. (Ed.)	1469, 270
Turco Products, Inc.	126
Tuthill Pump Co.	266
Ultra-Lap Machine Co.	261
Union Carbide & Carbon Corp.	189
Union Twist Drill Co.	26
U. S. Steel Corp.	129
Universal Boring Machine Co.	249
Universal Engineering Co.	250
V. & O. Press Co. Inc.	257
VanKeuren Co.	44
Van Norman Machine Tool Co.	12, 13
Vascoloy-Ramet Corp.	271
Vickers, Inc. (Ed.)	1485
Visible Index Corp.	145
Vitrified Wheel Co.	200
Vonnegut Moulder Corp.	250
Wagner Electric Corp.	169
Walker Co. Inc., O. S.	184
Walker-Turner Co., Inc.	91
Waltham Machine Works	120
Warner & Swasey Co.	84
Waterbury Steel Ball Co., Inc.	154
Weatherhead Co.	170
Webber Gage Co. (Ed.)	1458
Welch Industries Inc.	255
Westinghouse Elec. & Mfg. Co.	48, 148
Wheelock Lovejoy & Co., Inc.	247
Whitney Screw Corp.	92
Wickes Bros.	185
Wickman Corp.	28
Williams & Co., J. H.	181
Wilson, K. R. (Ed.)	1473
Wilson Mechanical Inst. Co., Inc.	261
Winter Bros. Co.	205
Wood & Spencer Co. (Ed.)	1480
Wyckoff Drawn Steel Co. (Ed.)	1486
Zeh & Hahnemann Co.	266

SEARCHLIGHT SECTION

Classified Advertising

Classification	*Page*
BUSINESS OPPORTUNITIES	237
CONTRACT WORK SECTION	234, 235
Agerstrand Corp.	234
Aurora Equipment Co.	235
Barton Machine and Tool Co.	235
Bay City Forge Co.	234
Eastern Tool & Mfg. Co.	235
Fidelity Machine Co.	234
General Pattern Works	235
Greist Mfg. Co.	235
D. M. Heller Engrg. Co.	234
Robt. Holmes & Bros., Inc.	235
King Foundries, Inc.	235
The Kirk & Blum Mfg. Co.	235
Stephen J. Lewis Engrg. Co.	234
A. H. Nilson Machine Co.	235
The Norlipp Co.	235
Read Machine & Tool Engr.	234
Reliance Mach. & Mfg. Co.	235
Thomas & Skinner Steel Products Co.	234
C. Vandegrift Co.	234
PATENT ATTORNEY	237
POSITIONS VACANT	236
POSITIONS WANTED	236-237
REBUILDING SERVICE	238, 242, 245, 246
Botwinik Bros. Inc.	245
East River Machinery Corp.	246
Reynolds Machinery Co.	242
Riverside Machinery Co., Inc.	246
Simmons Machine Tool Corp.	238
WANTED TO PURCHASE	237
WORK WANTED	237
USED SURPLUS EQUIPMENT	237
Aaron Machinery Co.	237
Acme Equipment Co.	237
Botwinik Bros.	245
Canal Machinery Co.	242
Cincinnati Machinery & Supply Co.	243
DeWitt Tool Co.	237
Dony Machinery Co., D. E.	242
Eastern Machinery Co.	242-244
East River Machinery Corp.	246
Emerman & Co., Louis E.	242
Falk Machinery Co.	239
Galbreath Machinery Co.	245
Hasco Machinery Co.	246
Hawley, J. E.	237
Hill-Clarke Machinery Co.	241-243
Hupp Motor Car Corp.	245
Hyman & Son, Joseph	243
Johnson Machinery Co.	237
Lang Co.	237
Lang Mchy. Co.	243
Marsh Machinery Co., A. R.	243
Maryland Technical Institute	237
Miles Machinery Co.	243
Morey Machinery Co., Inc.	244
O'Brien Machinery Co.	240
Osborne & Sexton Machinery Co.	244
Ott Machinery Sales, Inc.	245
Paul's Motor & Machinery Supply Co.	245
Reynolds Machinery Co.	242
Riverside Machinery Co., Inc.	246
Rosenkranz Machinery Co.	245
Simmons Machine Tool Corp.	238
S & S Machinery Co.	244
Strong Carlisle & Hammond Co.	243
Sun Machinery Co.	242
West Penn Machinery Co.	244
Wigglesworth Machinery Co.	246
Yard, Carl A.	237
Yoder Co.	237
Zeeze & Co., Alex.	245



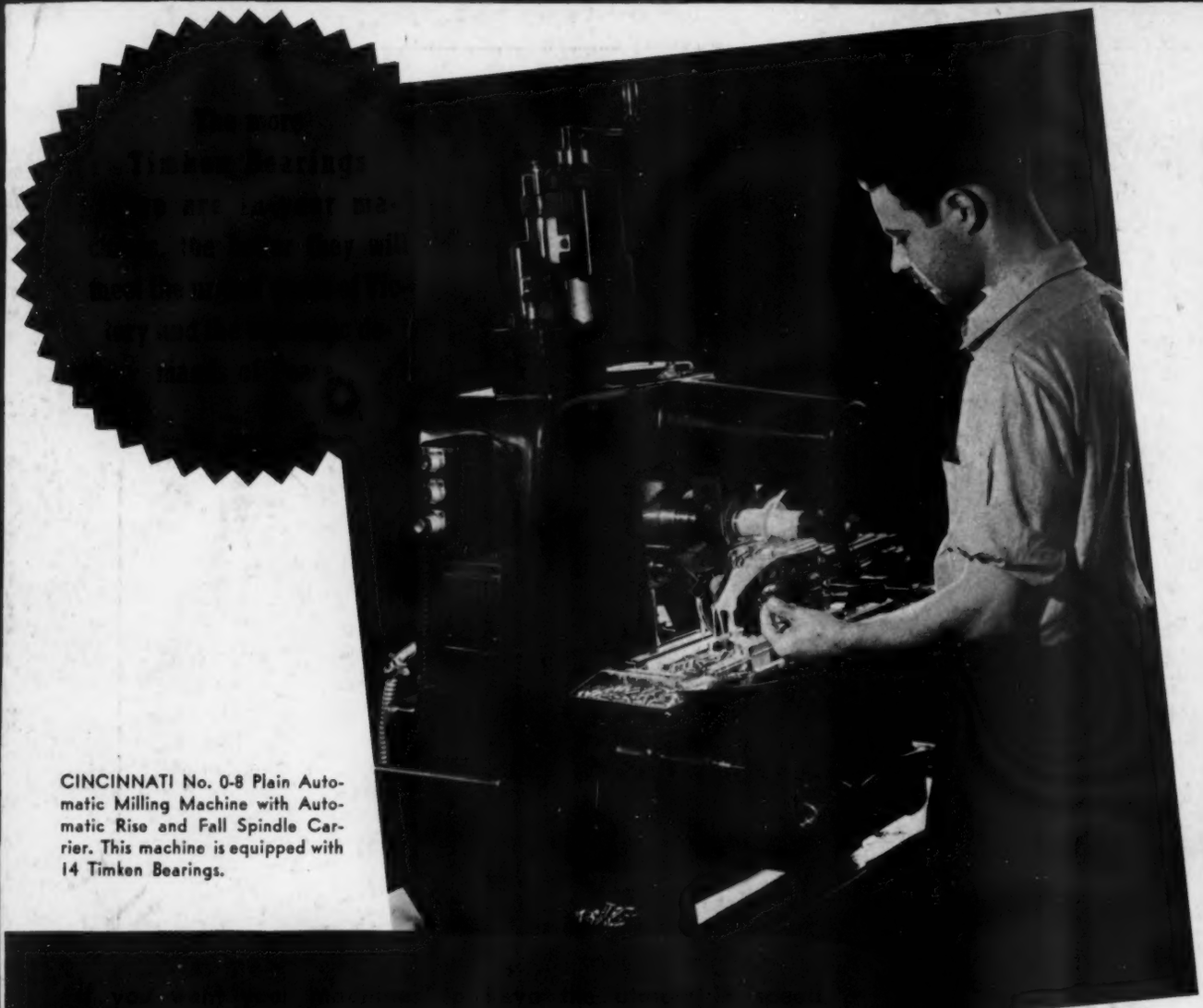
IT is only natural that the employees at the New Britain-Gridley plant should be working round-the-clock producing more and more New Britain automatics. In countless plants throughout the length and breadth of the land these automatics are assigned the job of making a wide diversity of parts for victory, all distinguished by extreme accuracy and in tremendous production quantities, all devoted to the same high purpose . . . that is, to make certain the security of Peace on Earth.

NEW BRITAIN AUTOMATICS

★ GET MORE DONE IN WAR OR PEACE ★

NEW BRITAIN-GRIDLEY • MACHINE DIVISION

THE NEW BRITAIN MACHINE CO. • NEW BRITAIN, CONNECTICUT



CINCINNATI No. 0-8 Plain Automatic Milling Machine with Automatic Rise and Fall Spindle Carrier. This machine is equipped with 14 Timken Bearings.